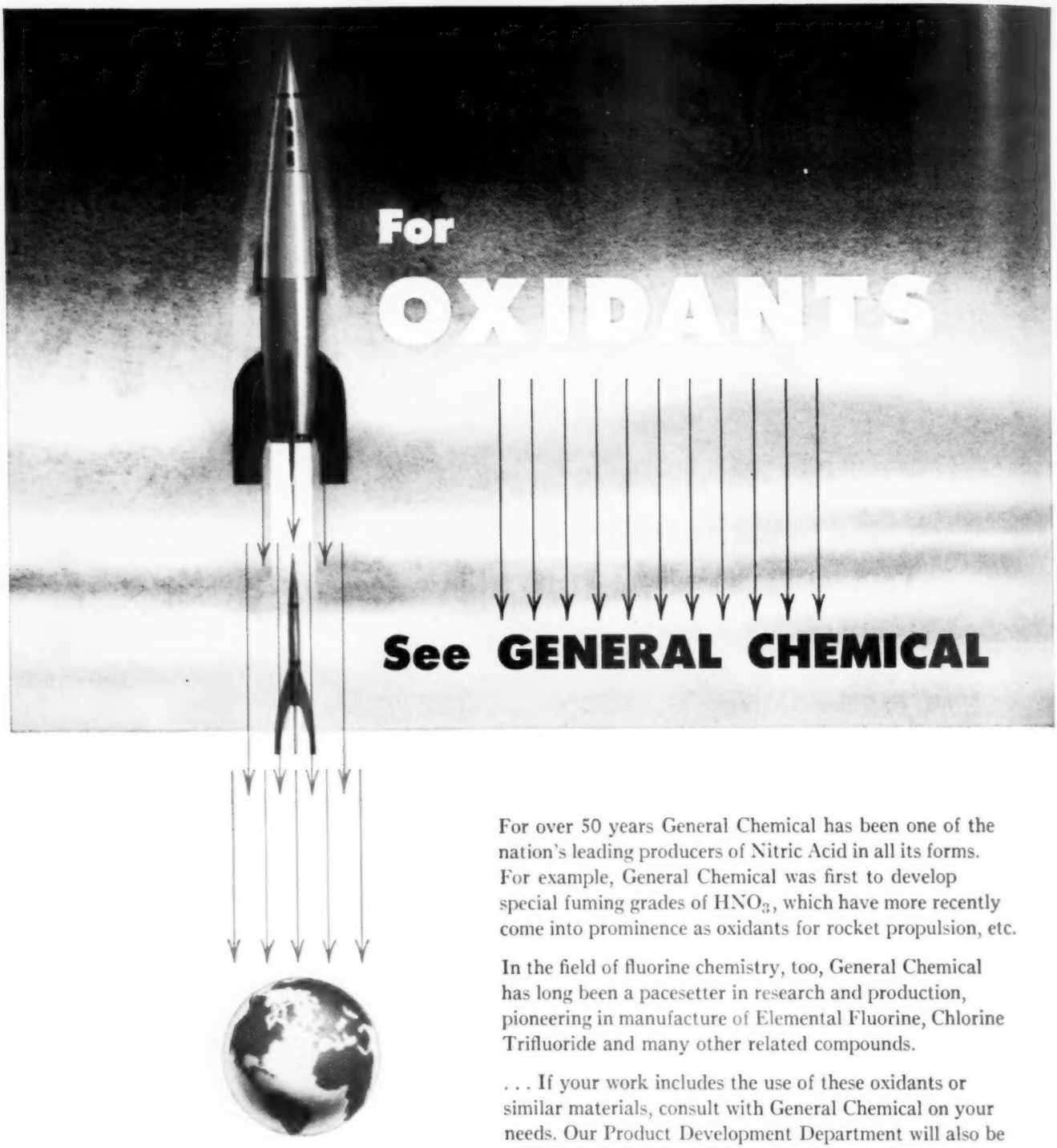
Chem

ARMED FORCES CHEMICAL JOURNAL

ACTION ON "RESCUE STREET"
(See article on Civil Defense Training)

Reni Photo

OCTOBER, 1953



For over 50 years General Chemical has been one of the nation's leading producers of Nitric Acid in all its forms. For example, General Chemical was first to develop special fuming grades of HNO_3, which have more recently come into prominence as oxidants for rocket propulsion, etc.

In the field of fluorine chemistry, too, General Chemical has long been a pacesetter in research and production, pioneering in manufacture of Elemental Fluorine, Chlorine Trifluoride and many other related compounds.

. . . If your work includes the use of these oxidants or similar materials, consult with General Chemical on your needs. Our Product Development Department will also be pleased to work with you in development of any special oxidants you might require. A letter outlining your requirements will be given prompt, *confidential* attention.

NITRIC ACID

White Fuming
Technical,
Sp. Gr. 1.49-1.50

Red Fuming
Technical—Various
Concentrations of NO_2

FLUORINE COMPOUNDS

Elemental Fluorine **Chlorine Trifluoride**
Bromine Trifluoride
Other Inorganic and Organic Fluorine Compounds

Product Development Department

GENERAL CHEMICAL DIVISION
ALLIED CHEMICAL & DYE CORPORATION
40 Rector Street, New York 6, N. Y.

Allied Chemical

Basic Chemicals for American Industry

ARMED FORCES CHEMICAL JOURNAL

OFFICIAL PUBLICATION OF THE ARMED FORCES CHEMICAL ASSOCIATION

SUITE 819, 2025 EYE ST., N.W., WASHINGTON 6, D.C.

VOLUME VII OCTOBER, 1953 NO. 2

COVER PHOTO

HELICOPTER RESCUE OF CASUALTY from top floor of building on Federal Civil Defense Administration "Rescue Street," Olney, Md. In foreground is special Rescue Truck, carrying 99 different types of rescue equipment and tools.

The Armed Forces Chemical Journal is the official publication of the Armed Forces Chemical Association. The fact that an article appears in its columns does not indicate the approval of the views expressed in it by any group or any individual other than the author. It is our policy to print articles on subjects of interest in order to stimulate thought and promote discussion; this regardless of the fact that some or all of the opinions advanced may be at variance with those held by the Armed Forces Chemical Association, National Officers, and the Editors.

INDEX

ADVERTISERS

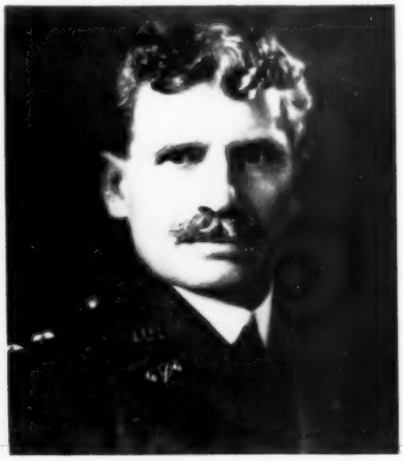
Published quarterly—January, April, July, October—by the Armed Forces Chemical Association, located at National Headquarters, Armed Forces Chemical Association, Suite 819, 2025 Eye St., N. W., Washington 6, D. C. Entered as second class matter at the Post Office at Washington, D. C., under the Act of March 3, 1879. Additional entry at Nashville, Tenn. Subscription price $2.00 per year to members; $4.00 per year to non-members.

ARMY CHEMICAL CORPS CHIEFS

The Army Chemical Corps attained its 33rd birthday in July 1953. See on middle pages herein "Fact Sheet on Army Chemical Corps," an official press release of The Department of Defense listing some of the numerous important contributions to human welfare resulting from Chemical Corps research and development work through the years. Printed below are pictures of the nine Major Generals who headed The Corps, since its establishment. (U.S. Army Photos).

WILLIAM L. SIBERT
1918-20

AMOS A. FRIES
1920-29



HARRY L. GILCHRIST
1929-33

CLAUDE E. BRIGHAM
1933-37

WALTER C. BAKER
1937-41

WILLIAM N. PORTER
1941-45

ALDEN H. WAITT
1945-49

ANTHONY C. McAULIFFE
1949-51

EGBERT F. BULLENE
1951—present

1954 A.F.C.A. ANNUAL MEETING TO BE IN WASHINGTON

The 1954 spring meeting of the Armed Forces Chemical Association Directors will be held June 3-4 in Washington, D. C. and the 1955 spring meeting in Cleveland, Ohio. (The spring meetings are those generally for the entire membership and which, by custom, are referred to as the annual meetings.)

This decision was made by the Board of Directors of the Association at their fall business session held at the Hotel Morrison, Chicago, Sept. 9. The vote on 1954, without a single Nay, followed a lively discussion in which Vice-President Harry A. Wansker, Chairman of the Committee on Meetings, argued the merits of the Nation's Capital for the 1954 meeting while Mr. L. C. Turnock, Jr., representing the Cleveland Chapter, championed his city. In deciding on Cleveland for 1955, the Directors apparently set a new precedent for giving long, advance-notice to the prospective host chapter and the membership generally.

The Directors' meeting was well attended. The program included an informal talk by Major General E. F. Bullene, Chief Chemical Officer, Department of the Army, and Honorary President of the Association. Among the reports, notable particularly, was that of Dr. Walter E. Lawson, chairman of the Association's Committee on Technical Manpower. It was decided that this group would continue in being and pursue its project for insuring an adequate supply to the nation of technically trained men and provisions to meet the needs of essential industry for such men as well as the needs of the Armed Services.

The Directors' meeting was followed by a reception and banquet at which The Hon. Charles S. Thomas, Assistant Secretary of Defense, spoke. Mr. Lewis I. Terry, president of Midwest Chapter, which sponsored the banquet, introduced the speaker whose address is reported in full in this issue. Mr. Thomas, until his recent appointment as Asst. Secy., of Defense, (Supply & Logistics) was Under Secretary of the Navy. Among other distinguished guests at the speakers' table were high-ranking officers of the Army, Navy, Air Force and Marine Corps. National President Louis W. Munchmeyer of the Association awarded the A.F.C.A. plaque to Mr. Morton Hague, past president of Midwest, for his outstanding achievements while chapter president.

A MESSAGE FROM OUR A. F. C. A. PRESIDENT

I have just returned from the Fall Directors Meeting in Chicago. It was a good one, good attendance and a very active and helpful discussion on a number of our AFCA projects. Major General Bullene, Chief Chemical Officer, gave us a most interesting talk concerning some of the problems facing the Chemical Corps and the solutions to these problems.

Once again we offer our thanks to the Midwest Chapter, our host chapter, for the fine evening program following the Directors Meeting.

Chemical and Engineering News photo

ASSISTANT SECRETARY OF DEFENSE THOMAS SPEAKING AT MIDWEST CHAPTER BANQUET

Picture shows some of the distinguished guests, left to right: Rear Admiral Nathaniel S. Prime, (USN Retired) 1st Vice President; Major General David H. Baker, Director of Procurement and Production, Wright-Patterson AF Base; Louis W. Munchmeyer, President of AFCA and Assistant General Manager of Ansco, Binghamton, New York; Lewis I. Terry, President of Midwest Chapter AFCA, Corn Products Refining Company, Argo, Illinois; Honorable Charles S. Thomas, Assistant Secretary of Defense (Supply and Logistics); Major General E. F. Bullene, Honorary President AFCA, Chief Chemical Officer, Washington, D.C.; Dr. Walter E. Lawson, Immediate Past President AFCA, E. I. du Pont de Nemours & Company, Inc., Wilmington, Delaware.

I was particularly pleased with the action taken by the Board of Directors in selecting Washington as the Annual Meeting city for 1954, and Cleveland for 1955. It was most encouraging to note the bidding from several locations for the Annual Meetings. I believe that the policy of determining the place of the meetings well in advance is a forward step that will permit much more effective planning and even better meetings. I am particularly looking forward to the 1954 meeting in the Capital city. This will be our first Annual Meeting in Washington. With the help of the nearby chapters and the many members in Washington and that vicinity we should have an unusually good meeting. The date for the meeting, June 3 and 4, 1954, is firm so please put the date on your calendar.

L. W. MUNCHMEYER

"Rescue Street" at National Civil Defense Training Center, Olney, Md., where students learn by practical work how to rescue entrapped persons from bomb-wrecked buildings.

TOP LEVEL CIVIL DEFENSE TRAINING

What is the Federal Civil Defense Staff College?
What does it teach and why?
Is there a practical course in rescue work?

Answers to these and many other questions are contained in this authoritative article prepared specially for the AFCA Journal by the Federal Civil Defense Administration—.

The National Civil Defense Training Center at Olney, Maryland, is the "West Point of Civil Defense."

It is teaching American men and women how to protect life and property in the event of an atomic attack on the United States.

Already this training has proved its worth in dealing with the devastation wrought by tornadoes, earthquakes, floods, explosions, and other natural disasters.

The Center's "Rescue Street" of partly demolished buildings, specially constructed to resemble ruins caused by bombing, makes it one of the nation's most unusual institutions and provides a stage for realistic instruction in the methods of survival in a wartime disaster or in a peacetime catastrophe.

In the grotesquely shattered structures of "Rescue Street," cluttered with heaps of rubble and other debris, students learn the most difficult rescue operations by working under conditions that they would encounter after a bomb blast. In conventional classrooms, they are taught the principles of civil defense and how to organize and operate effective programs in their home communities.

More than 3,000 civil defense leaders from all parts of the United States, its territories and possessions, have attended courses at this "University of Survival." Its graduates include representatives of Federal and State agencies, mayors, selectmen, public safety directors, health and welfare authorities, engineers, firemen, policemen, and other persons occupying positions essential to the civil defense structure in communities throughout the Nation. In a recent class, students came from such widely separated places as Alaska, Connecticut, Hawaii, and Florida.

The Training Center was established in 1951 by the Federal Civil Defense Administration under authority granted by the Federal Civil Defense Act of 1950. It is situated in the peaceful Maryland countryside about 20 miles northwest of Washington, D. C., on a site once occupied by a school for boys.

On the campus were modern school facilities, including a

National Civil Defense Training Center, Olney, Md., near Washington, D. C., site of former boys' school now used for Staff College and Rescue School.

Classroom scene at the Federal Civil Defense Staff College, Olney, Md.—FCDA Photo.

large gymnasium, which was converted into an administration building, with an auditorium, offices, and lecture halls. A brick dormitory accommodates 52 men students in double rooms on the upper floor and houses offices and classrooms on the lower floor. A 136-year-old white brick house containing 20 rooms, once the manor of an historic estate, furnishes comfortable quarters for women students.

The courses are arduous, and the rescue course in particular involves considerable physical hard work, but ample opportunities are available for relaxation and recreation when classes are over. Recreational facilities include a soft-ball field and tennis court. There are lounges and a library with a large collection of civil defense publications. Meals are served in a modern cafeteria.

A small pond and an abandoned swimming pool in back of the school building furnish an adequate water supply for fire-fighting demonstrations.

The Training Center consist of the Staff College and the Rescue School and offers two types of regular courses and a variety of special courses and conferences for civil defense leaders, as well as for representatives of industrial organizations and institutions.

Staff College

The Staff College conducts a one-week course in basic civil defense administration and operations to train civil defense executives in the knowledge and skills necessary to plan, organize, and administer broad civil defense programs.

The course is designed to give administrative personnel the plan for civil defense in the American community, to present a frame of reference by which communities may measure for themselves their progress in civil defense, and to indicate steps by which any community may develop a complete civil defense organization.

Various types of instruction are used, including lectures, panel discussions, student committee assignments, and field and map exercises in which students make practical application of their training under hypothetical conditions. Thus, a vast amount of information is packed into the intensive course.

The objectives of the course are:

1. To show the role of civil defense in the light of the changing international situation.
2. To present information on the probable nature, scope, and effects of an attack on the local community.
3. To present principles of organization and training upon which a community may build its civil defense program.
4. To review the assistance that State and local civil defense organizations may expect from the Federal Government.
5. To develop the principles of command and control in emergency operations.
6. To provide through field and map exercises and demonstrations an introduction to emergency operational problems.
7. To present a set of criteria by which the community may measure its progress in the development of its civil defense program.
8. To indicate how to develop a soundly phased plan for the further progress needed.

A detailed outline of the course follows:

The International Situation—(Lecture—Class Discussions)—The contrast of our foreign policy with that of communistic imperialism; the probability of attack on our home front in the event of war; military factors that make such an attack practicable; an evaluation of the nature and scope of an attack on the United States; why we need civil defense and why all citizens should be concerned about it.

Organizing the Civil Defense Program—(Lecture—Class Discussion)—The role of the Federal Government in civil defense, including the military; Public Law 920; Federal, State, and local civil defense organizations; suggested schedule for developing the local organization.

Recruitment, Training, and Utilization of Volunteers—(Lecture — Class Discussion — Class Committee Reports) — Suggestions for local planning and organizing the training program; recruiting and maintaining the interest of volunteers, including publicity and public information programs; assistance that may be expected from FCDA; written problems which students solve in committee and report in general class session; women's part in civil defense.

Attack Warning and Communications — (Lecture — Demonstration)—Tracing an attack warning from the time an unidentified plane, presumed to be an enemy's, is sighted until a general alert is sounded by public warning devices; outline of alternate communications systems for civil defense operations.

Principles of Tactical Operations—(Lecture—Demonstra-

This was a store before the bomb dropped. The roof has caved in and piles of rubble cover the floor. A rescue worker searches the debris for casualties—FCDA Photo.

tion)—Discussion of tactical principles involved in post-attack civil defense operations; principles of command and control; ABC reconnaissance; damage control organization and functions; discussion of the fundamental elements in and some practical suggestions for the development of a local operational plan for post-attack civil defense operations.

Civil Defense Urban Analysis and Principles of Ground Organization—(Lecture—Demonstration)—An appreciation of the necessity for carrying out a civil defense urban analysis in order that an area can be analyzed for its points of weakness and strength; the methods used in accomplishing a total analysis of an area, resulting in an intelligent anticipation of problems of defense which must be overcome by careful planning of ground organization and operational plans for individual services; assessing of damage, and identifying critical features.

Organization and Operations in Support Areas—(Lecture—Demonstration—Class Discussion)—The role of support communities in civil defense, including organization and operations in local defense, fixed support, mutual aid and mobile support; class problems illustrating some of the fundamental principles.

Shelter—(Lecture—Class Discussion)—Suggestions for surveying and modifying existing structures to provide shelter areas, and for the construction of home shelters.

Supply—(Lecture—Class Discussion)—An analysis of the types of supply that may be needed and procedures for obtaining them; basis on which needs for supplies are being studied.

Schools in Civil Defense—Discussion of protection against atomic attack in schools and essential curriculum content for the atomic era.

Post-Attack Operational Problem—(Class Discussion—Demonstration)—Faculty members and students assume roles of civil defense officials in "City X" and conduct meeting to plan operations under post-attack conditions; examples of coordination among emergency welfare, warden, police, transportation, medical, and other civil defense services in aiding victims; anaylsis and demonstration of the nature and extent of assistance that can be given by a support community.

Control Center Exercise—Manning control centers and taking required action before and after a simulated attack.

Rescue Field Exercise—Involving combined staff training and rescue training; manning of control centers, use of public warning devices, emergency communications, and rescue activities after a simulated attack.

Map Exercise—Grouped around a large and realistic three-dimensional map, students direct civil defense operations before and after a simulated attack on "City X," in a practical application of the week's lessons.

Natural Disasters—Relationship of civil defense and natural disaster planning and organization; Federal responsibilities; procedures used by States in requesting Federal assistance; relationships between the Red Cross and Government programs.

Review and Evaluation—A critique of the week's activities; students are asked to make suggestions for increasing the effectiveness of the program.

The Staff College course is intended primarily for:

a. State Directors of civil defense, their deputies and asstants, including control officers.
b. State Directors of special services, including law enforcement, fire fighting, welfare, engineering, rescue, shelter, facilities self-protection, health, transportation, communications, personnel, training, supply, evacuation, and attack warning.
c. Area Directors and their staffs.
d. Mobile support officers.
e. Mutual aid coordinators.
f. Local directors, their deputies, and assistants, including control officers.
g. Local directors of special services.
h. Executive personnel of cooperating organizations, including civil defense coordinators of industrial plants, schools, business organizations, and other institutions; members of the Armed Forces serving as liaison officers with civil defense authorities or having damage control responsibilities; civil defense coordinators of national organizations, such as the American Red Cross; Federal, State, and local officials with responsibilities related to civil defense.

Members of constituted civil defense organizations who want to take the Staff College course normally apply to their State civil defense director, who submits nominations to the Director of the National Civil Defense Training Center. Other persons, including representatives of industries and institutions, may apply through the organization they represent or by communicating with the Director personally. Women are encouraged to enroll inasmuch as it is estimated that they will constitute a majority of the local civil defense forces.

Rescue School

The Rescue School offers a two-week course for training rescue instructors. It is intended for safety supervisors and teachers, leaders of rescue organizations, representatives of industrial plants and institutions, fire fighters, policemen, and wardens, including women who will perform warden duties.

The course is considered highly important because the rescue of injured persons trapped in wrecked buildings requires the use of skilled techniques by trained rescue workers. A knowledge of building construction and of the way a structure may collapse or otherwise be damaged, and of how to go about the job with a minimum of danger to the victims and to the rescuers is also essential. The training facilities of the Center present the basic situations most likely to confront rescuers in the types of buildings most common to this country.

The rescue course gives valuable training to wardens, who are responsible for teaching residents of their neighborhoods how to protect themselves, their families, and their property. In case of an attack, the regular fire-fighting and rescue services would be fully occupied. Fire and rescue wardens would have to be prepared to put out small fires and perform basic rescue work.

(Continued on page 48)

THE CIVILIAN SCIENTIST AND

By DR. W. ALBERT NOYES, JR.
Dean of The Graduate School, University of Rochester

Distinguished scientist and educator, former president of the American Chemical Society and currently a director of the Armed Forces Chemical Association, here discusses the various methods of utilizing civilian scientists for research and development work of the Armed Services and gives his opinions.

When World War II started in Europe and it became evident that sooner or later the United States would be drawn into the conflict, a start was made to expand enormously the use of science and of scientists in the preparation for war. Those who were intimately connected with the hectic period which began in 1940 can well remember the confusion, the heartaches, and the wasted effort which prevented or delayed concrete achievements. The lessons which should have been learned during this period may well be forgotten by the beginning of the next major conflict just as many of the lessons of World War I had been forgotten by the beginning of World War II. It is, perhaps, worth while to review briefly some of the history of this period and then to try to evaluate our present position with an eye to the future.

At the close of World War I a wave of idealism swept the world. The world had, presumably, been made safe for democracy and a long period of uninterrupted peace was anticipated not only by idealists but by many others who were supposedly hard headed. There were disarmament conferences which superficially seemed to accomplish something, there was a wave of prosperity during the 1920's which took the mind of the man in the street away from war and from military problems. Even the crash in 1929, the depression which followed, and the advent of Hilter to power in Germany in 1933 did not awaken most of us to the fact that the world situation was so unstable that a major conflict might occur.

During the 1920's budgets for the military establishment were cut because we were paying off the debt from World War I and anyway war seemed remote and other things more important. During the 1930's, with the federal budget badly out of balance due to the depression, military budgets were cut even further. Thus the laboratories and arsenals mainly responsible for the application of modern science to problems of war not only had inadequate personnel but had so little funds that they were unable to do much more than paper work until budgets began to expand in 1939 and 1940. It is perhaps surprising that so much progress had been made, but without a more than two years delay between the start of war in Europe and Pearl Harbor the situation could well have led to a major disaster.

It is safe to say that in 1940 American scientists other than those directly employed by the Armed Services knew little or nothing about military problems. By and large those scientists, relatively small in number, who had participated in military activities during World War I had stepped out of the picture and were either too old to be of use or had to begin all over again to learn about defense matters. There was no adequate civilian organization upon which the Armed Services could call for help. The number of regular officers connected with research and development was too small to assume the necessary leadership and in any case they had had too little experience in dealing with scientists in industry and in academic institutions to understand how to use them effectively.

Establishment of the NDRC

The National Academy of Sciences was founded in 1863 as a group of scientific advisers to President Lincoln during the War Between the States. Its character gradually changed so that by 1917 it had become largely an honor society where eminence in science was considered more in electing its members than were qualifications which might make them of use to the government on military matters. The National Research Council was established in 1917 to enable the National Academy of Sciences to fulfill its function of advising the government in time of war. The National Research Council is free to call on all scientists, whether or not they are members of the National Academy of Sciences, to serve on committees and to assume administrative posts. Thus a structure was brought into existence which could be made to serve adequately for providing advice and information to the govern-

ment on any scientific matter. It should be emphasized, however, that the National Academy of Sciences is not a government agency but it does have a federal charter. It has a peculiar status as a semiofficial body (the National Research Council is actually listed in government telephone directories) but it operates with private funds except in-so-far as it sometimes has contracts for specific purposes with government agencies.

By 1939 or 1940 the National Research Council was not concerned greatly with military matters, although it performed many useful functions. It was not structurally suited to become an operating body of the type which appeared to be necessary to bring civilian scientists on a large scale into the war effort. Hence in 1940 the National Defense Research Committee was established by executive order of President Roosevelt. The NDRC later became one of the component parts of the Office of Scientific Research and Development, OSRD, the other main parts being the Committee on Medical Research, CMR, and the Office of Field Service, OFS. It was NDRC which fathered the work which later was taken over by the Manhattan District for the development of the atomic bomb.

It is neither necessary nor appropriate to enter into the history of the OSRD and of the Armed Services during the war period. These histories have been written many times and from many points of view. We are interested more in the philosophy of the use of civilian scientists. One could debate at length whether or not it was wise to start NDRC and later OSRD which were supposed to work on defense matters and yet which were not part of the Armed Services. It is the opinion of this writer that civilian agencies of this type were necessary as conditions existed in 1940. For one thing it was easier to achieve the necessary contacts with our British colleagues prior to our entrance into the war. They had been thinking about war problems longer than we had in the United States and it was possible from them to learn much about the important problems which had to be solved. Indeed the contacts with British scientists during the period from 1940 to the close of the war were invaluable in helping us to keep focussed on essentials. Another aspect which could not be neglected was the freedom given to scientists to start new ventures some of which led to fruitful results in actual practice. Quite possibly some of the developments in atomic bombs, screening smokes, radar, and other important areas could never have been achieved if scientists had been forced into the structure of the Armed Services as it existed in 1940. The unhampered ability to bring in new leaders and new direction to programs was at that time essential. Use could be made on a huge scale of industrial and academic laboratories and personnel, often by the use of well organized research establishments already in existence. It must be remembered that at that time the Armed Services did not have the experience they have since acquired about dealing with these establishments through contracts. In a real sense NDRC and OSRD paved the way for the kind of contract which has now become fairly common.

Need for Mutual Trust

There was, of course, another side to the picture. Military personnel had to be educated to trust civilians to keep secrets. There were delays due to clearance and even after proper clearance officers had some difficulty in understanding that to be effective civilian scientists had to be let in on many important secrets. In retrospect one cannot say that there were more violations of security in civilian than in military organizations. Certainly some of the important "leaks" occurred in military organizations, all of which had to be expanded so enormously that they could not be completely sure of the trustworthiness of all of their personnel.

It is difficult to put the finger on the main causes for the frustration which many of us felt, particularly during the years immediately following 1940. We had a feeling that we did not know the important problems and that those persons who did know what they were, were reluctant to tell us about them. In retrospect one can be more charitable than during this trying period, because I am sure now that in 1940 military leaders themselves often did not know enough either about science or about the way the war was to be fought to be able to give us the necessary guidance. This fact coupled with some jealousy and suspicion made us feel frequently that our services were not wanted. The blame was by no means solely on the military, however, for the scientists did not understand the military structure, many of them had never worked in large organizations and did not understand the necessity for red tape and many of them quite naturally could only be described by uncomplimentary words not fit to print. By the end of the war many of these difficulties had been overcome and there was much more mutual respect and tolerance for each other by military and civilian personnel.

Ways of Utilizing Scientists

At the close of the war OSRD was disbanded. Some of the contracts were taken over by the Armed Services, most were abandoned. Since 1946 the civilian scientist has relationship to the Armed Services, if at all, in one or the other of the following ways: 1) as a direct employee. The number of scientists employed in the military establishment is, of course, far greater than it was in 1940; 2) as a consultant who spends from a few to a great many days per year on defense work depending on the time available and on the usefulness of the work; 3) as a contractor or as a contract employee; 4) as an employee or contract employee of the Atomic Energy Commission or of some other government agency which does work of interest to the Armed Services; 5) as a member of

some Board or Committee (usually with the title of consultant thrown in).

We are not concerned mainly with the government employees. They are the backbone of the scientific bureaus of the government and will continue to be so. They must be of high quality and they must have competent direction. Unfortunately some recent incidents, such as the Astin case at the National Bureau of Standards, have made it more difficult than ever for the government to employ good scientists and many young men will take almost any other job in preference to one on civil service. Probably the civil service laws should be changed to make it easier to get rid of incompetents and some way should be found to ensure more rapid promotions for the able. There are a great many very able civil servants but they could do better work than they now do if they were given better guidance and a little more freedom from restrictions. The system of rotating officers in key positions will inevitably tend to introduce from time to time officers unfamiliar with the duties they are to perform. In the military structure it would be possible and desirable to give more positions of authority to permanent civil servants.

Discusses Consultant System

Consultants are a necessary part of any scientific effort, either in industry or in government, but consultants should be used properly. A part-time employee should not assume administrative responsibility and his advice should be sought only on special problems for which he has outstanding competence. If a part-time person attempts to assume administrative responsibility he is apt to be much more of a hindrance than a help. On the occasion of his infrequent trips to an installation he must be brought up to date, a process which wastes the time of the full-time employees whose main effort should be devoted to getting jobs accomplished. A part-time person will never be an adequate substitute for a competent full-time employee. There is one reason for having consultants which must not be overlooked, however. In case of an emergency many of them will enter upon full time duties and they will be of immeasurably greater value under such circumstances if they have been able, even for a few days a year, to keep some familiarity with military problems.

In my personal opinion the system of consultants has been vastly overworked since the close of the war. Some of these gentlemen enjoy paid trips every now and then. Some of them really need the fees to eke out meager academic salaries. Some of them like to have their egos flattered by being able to say that they are badly wanted in a lot of different lines of activity. The military personnel like also to be able to trot them over to the Pentagon or put them otherwise on display to demonstrate the high quality (?) of the brains on which they are able to call.

Certainly the system of consultants needs to be examined carefully and only those retained who know their proper place and who restrict their advice to areas in which tney are competent. By and large more effort should be made to use young men of ability, even admitting that they do not afford such good advertising copy. We are running the same danger that we ran after World War I, namely that the older men of experience are keeping some interest in military affairs and the young ones are not being brought in adequately. Since the next major conflict may be some years off, the key men of World War II will probably be too old to be of use and it is important to have young men who are familiar with military problems. The older men like the writer should be given their walking papers as soon as proper young men can be introduced to the program.

Evils of Committees

If there are some evils in the system of consultants they pale into insignificance when compared to the evils of boards and committees. Immediately following the war there was a period of confusion when many persons were leaving government employ, when certain activities were being abandoned and others started, and when it was difficult to ensure competent planning for the future. During this period there were many civilian scientists who had been active during the war and who still were very familiar with the problems of the Armed Services. By the formation of boards and committees it was possible to obtain reasonably competent guidance for programs, but as time has gone on it has become evident that the need for many of these agencies has disappeared and indeed that they may serve as mechanisms for retaining useless programs and building empires. Most of the persons on these bodies are unable to keep fully abreast of developments and all too often they are called upon to approve facility proposals, details of programs, and even budgets with which they cannot possibly be adequately familiar. When boards and committees are used as devices either for promoting some pet idea or for shifting responsibility away from officers and full time employees, they tend to weaken rather than strengthen the permanent defense framework.

A careful re-examination of the board and committee structure of the Department of Defense is essential. Under no conditions should boards and committees deal with administrative matters. They may under suitable circumstances be asked for policy guidance, but even here care must be exercised. Suppose a decision has to be made as to whether or not a certain type of warfare should be developed under high priority. The decision should not be based on whether or not this is a good type of warfare per se, i. e. whether one would use it if nothing else were available, but it must be compared with other types of warfare which might accomplish the same objective. Thus a group of specialists in one type of warfare may be utterly incompetent to make comparisons with another type and may even, in fact, feel called upon to enter upon a propaganda campaign for its own specialty. The comparison and the final decision, therefore, will either never be made and the effort of the country wasted in developing the mediocre along with the good, or it may be made by persons unfamiliar with the technical aspects of the problem. It can be appreciated that

this problem is most acute for those types of warfare never or little used in practice so that no operational data are available.

Many of the committees and boards of specialists are of little value and may even do the country real harm. It should be possible for higher echelons to call together competent ad hoc boards and committees to help establish policy. These should be temporary, but should be expected for short periods of time to devote a great deal of effort to the solution of a major problem. If a decision has to be made whether to pursue the development of item 1 as distinguished from an altogether different item 2, a mixed board of military and civilian personnel appointed for this specific purpose could be of great value. It should pass out of existence as soon as possible and before it can develop deep seated prejudices.

Merit in the Contract Method

The contract has been a device much used since the close of the war and when properly used it is of great value. At times it has been used to circumvent personnel ceilings and occasionally as a means of disposing of surplus funds toward the end of a fiscal year. When used in these ways to get around the intent of a law of the land, contracts cannot be condoned. On the other hand it is possible by contract to obtain the services of research teams of proven competence and to get jobs done which the Armed Service installations are not equipped to handle. When properly used contracts provide an important adjunct to the defense effort.

The Atomic Energy Commission has used the contract method for its major installations such as Oak Ridge, the Argonne Laboratory, and Brookhaven. The contractor has somewhat greater freedom to hire and fire than if these installations were under civil service, and moreover there is probably greater freedom to purchase materials and provide competent direction. This type of global contract has not been used heretofore in the Department of Defense, but some consideration is being given to its introduction. It is true that there have come into existence some companies whose sole business seems to be in the field of government contracts. In general, these companies do not have long histories of competence in technical matters. If contracts are to be let on a large program one must ensure that the company or other body chosen as contractor is fully competent to do the job. The mere awarding of a contract will not necessarily ensure improved operations. Often contracts are given for so-called "management surveys" without adequate realization that this is an excellent device for wasting the taxpayers' money. To be of use a management survey must not only indicate where a structure is weak but provide means for correcting the weakness. If an installation is already weak it will not be materially improved by changing the positions on an organization chart of existing personnel.

It may be concluded, therefore, that contracts are essential to the defense effort but that they are an adjunct to the main effort and not a substitute for it unless used, as by the Atomic Energy Commission, as the main method of doing business.

There are those who believe that research and development on defense matters should be put in the hands of a civilian organization after the fashion in the United Kingdom. This is one way of doing business, certainly a very good way if properly organized, but it is not in the tradition of the Armed Services in the United States. Our research and development effort has more or less grown like topsy with much duplication of effort and without adequate placement of responsibility at the level where the actual work is being done. We need to examine our structure to decide where the wastage of money and of personnel is occurring, but we could not change to a completely civilian picture without a major upheaval. This we cannot afford to do in the present unsettled condition of the world. We must rely, for the time being at least, on patchwork remedies and our main effort should be devoted to placing competent persons in key positions.

Value of Full-Time Personnel

Will the equivalent of a new OSRD be necessary if we encounter a new emergency? This is a hard question to answer. The OSRD might have been too late to be of value if it had not been started eighteen months before Pearl Harbor. If it had been in existence much longer it might have gotten into a rut. I am sure we all recognize that there must be more than an improvement of existing items or even an improvement of existing methods of fighting wars. The atomic bomb was revolutionary and other revolutionary items applicable to war are possible. Some method must be found of ensuring that this country is in the lead in these matters. Have we a mechanism now in existence for giving proper thought to the really new or must we rely on chance as we did last time when a small group of scientists sold the idea of an atomic bomb to the President of the United States? This is one of the difficult matters to handle, but the scientist who is thinking full time about military matters is the one most apt to have good ideas. We must somehow ensure that a good idea from any source is given a sympathetic hearing. A new organization such as OSRD had real value in this area last time and possibly something equivalent to it may be necessary again.

This is a rambling discussion of some of the problems which confront the Department of Defense and which concern military personnel and civilians alike. In the last analysis, however, there can be no substitutes for administrative ability and for scientific brains. These two must be found and wedded in the Armed Services to produce a stable structure for research and development. Organization charts may be changed, new structures may be built, and more and bigger committees may be brought into existence, but the competence of the full time personnel will determine the success of the program.

CHARLES S. THOMAS
Assistant Secretary of Defense

NEW DEPARTMENT OF DEFENSE ORGANIZATION

Address by Assistant Secretary of Defense Charles S. Thomas before the Armed Forces Chemical Association on September 9, 1953, at Midwest Chapter Banquet, Chicago, Illinois.

I am pleased to be here tonight to address your Association. You and the members of your Association have a great stake in this country of ours and also have a great stake in the Department of Defense which has the primary responsibility for the defense of our country.

It was suggested that I discuss with you tonight the new organization of the Department of Defense and the future effect which its policies will have on industry. To begin with, I would like to quote to you from a letter which I received from a very good friend of mine in Los Angeles when it was announced that there would be 9 Assistant Secretaries of Defense, "I studied the new organization plan at some length when it was being worked over in Congress, and it appears to be another huge superstructure." I think a good many people had that same feeling but let's see whether or not that's correct.

However, before explaining to you the present Department of Defense organization, let's go back for a minute and take a look at the former Department of Defense set-up.

First, I would like to remind you that Mr. James Forrestal who originally conceived the Department of Defense organization, envisioned it as being a small policy making and coordinating office. This organization was only to make policies for the 4 services and also coordinate their activities—under no condition was it to get into operations. Also, it was originally conceived to be staffed by about 100 people. However, like many other past Administration activities, it was extended far beyond its original concept and purpose, and when this new Administration came into office on January 20th, there were not 100 but rather 3,103 people in the Defense Department. With that many people it obviously could not stay out of operations and had developed into an entirely different organization than had been planned.

Explains New Organization

With that background, now let's take a look at the new Defense set-up as of today. Under Reorganization Plan No. 6, recently enacted by the past Congress, the Department of Defense now has a Secretary, a Deputy Secretary and 9 Assistant Secretaries. This is obviously the huge superstructure that my friend mentioned in his recent letter. But the whole crux of this question is going to be just how these new Assistant Secretaries will function. So to answer it, let's take my office for example, the Assistant Secretary of Defense for Supply and Logistics.

My charter assigns to my office the following responsibilities: "developing policies and procedures for the Department of Defense in the broad fields and procurement, production, distribution, transportation, storage, cataloging, requirements and mobilization planning." It then goes into the details of each one of these categories.

I should like here to remind you that these responsibilities are, to a very large extent, those which were assigned to the old Munitions Board.

Now the Munitions Board on June 30, 1952 had 882 people on its payroll (note: 245 were in the Defense Supply Management Agency). As you can see, this one segment of the Department of Defense ended up by having almost 9 times the amount of people the entire Department of Defense was conceived to have. Obviously with this many people, and many of them very senior in civil service grades, they were bound to get into operations and details—and they did just that!

In our new organization we are forgetting the past, and rather than trying to whittle and cut down on an organization that had been expanded into something it never should have in the first place, we are instead starting out all new and setting up a completely new organization chart and we will then staff that organiaztion with only the people necessary to carry out the responsibilities as assigned to us under our new charter. And again I should like to remind you that this new office will only make policies for and coordinate the activities of the 4 services. We will not get into operations and details. Our detail requirements such as reports, figures, statistics, and the like will be assigned to the staffs of the services themselves to prepare for us. They will, only when necessary, be consolidated in our office.

Examples of New Procedure

At this point, I might give you two concrete examples of how our office expects to function in the future. These were the first two important procurement situations that came to my office to be resolved.

In June 1952, the Secretary of Defense issued a directive establishing the Armed Services Textile and Apparel Procurement Agency. This was later termed "ASTAPA." The idea of this new Agency was to centralize in one office the pur-

chase of all textiles and apparel for all 4 of the services—a tremendous job. This Agency, again instead of being organized on a compact, efficient basis, developed into a large unwieldy operation with 526 people and costing approximately $3,000,000 to operate the first year. It caused none of the benefits for which it was created and became discredited by virtually everyone. As a result, the last Congress cut off its appropriation and thereby automatically forced its dissolution. The services were then back where they had started—they could each buy independently of the other unless controlled by one office.

I called the representatives of the 4 services together and very simply told them that it was obviously **not** to their own best interest to go into the market independently of each other and buy in competition with each other. This would only result in high prices, unsound buying, and eventually in even tighter control by the Congress, and that's the one thing that they all prefer not to have. I told them it was, therefore, basic to their own best interest to develop some coordinated buying plan and give one of the services the responsibility of administering the plan so that they would buy on a coordinated basis and in conjunction with each other rather than in competition with each other.

The services immediately recognized that this was to their own best interests and got together and have developed a well-organized, well-coordinated procurement plan for the purchase of all textiles and apparel, and it's my opinion they will administer this program both efficiently and economically.

We had the same problem in the buying of petroleum for all the services. We again called the service representatives together and requested them to come up with their own procurement program where their buying efforts would be coordinated and where there would be a single responsibility that we could look to for proper administration of the program. And they have also come up with a sound program.

As I said before, my office, the Assistant Secretary of Defense for Supply and Logistics, is going to be a policy-making and coordinating office—it isn't going to get into operations.

Expansion of the Services

So that being the case, I think it's appropriate that we now take a look at the armed services who are going to be charged with the administration of these policies. I would like to tell you what I think personally of these services.

They are great services! If there is any question about that, just think back to World War II and the tremendous military might the four services were able to mount in a relatively short time—let's not forget the Army at North Africa and Normandy, the Navy at the San Bernardino and Surigao Straits, the Air Force over Germany and Japan, and the Marine Corps at Guadalcanal and Iwo Jima, and on down through the war. There has never been anything like it.

When it comes to the logistics of the services, they have, in my opinion, in many cases been maligned and criticized for certain situations for which they were not entirely to blame. You may remember the recent "Chamber of Horrors" exhibit where certain items which appeared to be the same were displayed, some having cost much more than others.

If you had seen just that one exhibit, you would have gone away feeling that all of the services' procurement was atrocious—but that isn't right. Sure, they have had some bad buying—they have done some really bad buying—and as a matter of fact, there has been a lot of waste and overlapping and duplication. But you don't pay off on the few good or bad examples—you pay off on the average.

(Continued on page 15)

TOP: Far from the easy-going ways of the college dormitory is the precision demanded by the Army even in the making of a bunk. A newly-arrived ROTC cadet gains a bit of knowledge which will prove useful in future inspections.

CENTER: Chow in the field after a hard morning on the rifle range. Acquaintance with Army mess operations was speedily gained by personal participation in KP.

BOTTOM: Cadets squeezing out that extra pull-up during a Physical Training test. These and other toughening exercises proved their worth as more than 80% of the cadets showed marked improvement from test to test.

A proudly flapping guidon announces that this trimly marching unit is Company "C" of the 1953 Chemical ROTC Summer Camp.

R. O. T. C. SUMMER TRAINING AT FT. McCLELLAN

The 1953 R.O.T.C. summer training camp for college students seeking commissions in the Chemical Corps was conducted at Fort McClellan, Ala., with an attendance of 382 cadets from ninety colleges and universities throughout the country.

Of these, 330 had still another year of college to do. The other fifty-two were this year's graduates and received commissions at the conclusion of the camp, presented by Major Gen. E. F. Bullene, Chief Chemical Office, Department of the Army.

The Chemical Corps maintains Chemical R.O.T.C. units at eleven colleges and universities, however, students specializing in chemical subjects at other colleges are authorized to apply for Chemical Corps assignment and to attend the Chemical Corps training camp.

The schools where Chemical Corps units are maintained are: Agriculture and Mechanical College of Texas, Canasius College, Georgia Institute of Technology, Idaho State College, Massachuetts Institute of Technology, Ohio State University, Purdue University, St. Peters College, University of Delaware, Vanderbilt University and Wake Forest College.

The camp was under the command of Colonel Michael E. Halloran, post commander. Technical training facilities were provided by Colonel John R. Burns, Commanding Officer, Chemical Corps Training Command with headquarters of Ft. McClellan. The camp executive staff included Lt. Col. J. S. Terrell, Jr., Professor of Military Science & Tactics at Wake Forest College, deputy commander; Lt. Col. David V. S. Kirkpatrick of Idaho State College, executive officer and Lt. Col. Woodrow W. Reagan of Massachusetts Institute of Technology, deputy for training.

Pictured here are scenes of some of the camp activities.

U. S. ARMY PHOTOS

Rifle inspection, or, the search for the speck. ROTC cadets preserve an impassive and smart appearance as they await the verdict of an inspecting officer, who, like most, doesn't miss a thing.

Major General E. F. Bullene, Chief Chemical Officer, U.S. Army, awards a reserve commission to a graduating cadet at closing exercises of the 1953 Chemical ROTC Summer Camp.

ASST. SEC'Y THOMAS

(Continued from page 13)

So now let me cite you a few figures and then let's see if, in all fairness, the blame accrues entirely to the services.

In 1935 the total appropriation of the Army, Navy and Marine Corps—there was no Air Force then—was little more than ½ billion dollars. Actually it was only $590,000,000. A very short time later, these same services had appropriated to them from 1942 through 1945 approximately 300 billion dollars. In other words, in that short period of time, they spent more than 500 times as much as they spent in the year 1936.

There was one particular example during the last war that gave me personally a feeling of the relative vastness of this expansion. In 1944, when we were starting to mount our great offensive in the Pacific, I was sent out by Mr. Forrestal to the Naval Supply Depot in Oakland, California. This Depot was loaded with critical items, but they were 90 days behind in their paper work. The material was there, all right, but they didn't know it or wouldn't be able to use it for 90 days.

Now, think of this. The entire Naval appropriation in 1936 was 350 million dollars. That was for personnel, maintenance, ships, aircraft—everything. And now at this one Naval Supply Depot, a short time later, there was 426 million dollars of inventory—(incidentally there is now over a billion dollars in this same Depot today)—and **remember** this is only one of the Navy's many supply depots, and it doesn't include those of any of the other three services.

Just ask yourself what would happen if your business should even double in any one year—you would be fraught with difficulties and would make many mistakes—it would be very costly to you.

So I ask you, could any organization expand as fast as the services have been forced to expand, and build a supply system to absorb such an expansion of materials and technical items and not make a lot of mistakes?

It was inevitable that after having expended the 300 billion dollars in such a short time in the last war, there were bound to be surpluses and excesses at the end and there were—but let's don't fool ourselves—war is that kind of a wasteful operation. Then also let's remember that after World War II instead of an orderly demobilization, the demand was made by the Congress and the mothers and fathers to bring the boys home right now—and we did just that and then we started the heavy cuts and paring to the bone of the Defense program.

No sooner had that been done than then came Korea and another 150 billion dollars was pumped into the supply system—it again became a race to spend money and because of our unpreparedness the same mistakes had to be made all over again.

Now we, as practical businessmen, all know that you just can't plan well and spend efficiently, that much money in that short a time.

So I challenge anyone to show how our services can be subjected to such peaks and valleys and rapid acceleration and deceleration and be expected to do a good planning and an economical procurement job.

So much for that.

Now, I would like to tell you what I personally think of our defense team. To begin with, I have a personal liking and a great respect for both Mr. Wilson and Mr. Kyes—both men have been successful in everything they have ever done—and they have made great personal sacrifices to come to Washington to serve their country.

But what I like equally well about them is that they are used to large organizations, to dealing in large volumes and modern systems, and best of all, they are planners. They are used to making a long-range plan and adhere as close to that

(Continued on page 56)

WAR IS NOT ALL FIGHTING

BY

MAURICE E. BARKER
COLONEL, U. S. A.
RETIRED

WITH PHOTOGRAPHS BY THE AUTHOR

Peace and War in Italy during the spring of 1944.

A story of some of the things a chemical officer and his units have to do in the field besides shooting at the enemy.

The Chemical Officer of a division, corps, or army in the field must be ready to fight when the time comes; but there are many other jobs that comes his way, too. It's about the work, and not the fighting, that I would like to 'reminisce' for a while. If the reader feels particularly bloodthirsty he is warned to tune-in on one of the detective thrillers.

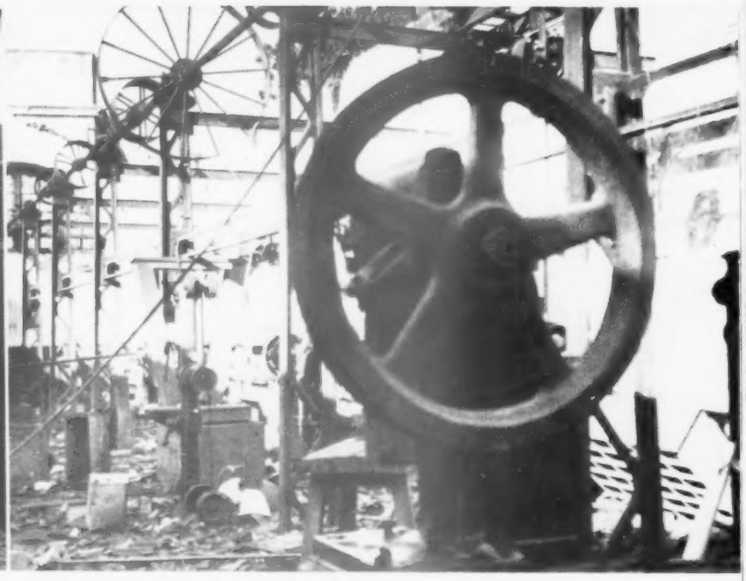
Bruce Humphreyville and I learned about work when we landed with General Patton's Western Task Force in French Morocco, back in November, 1942. We had Tommy guns and a load of ammunition all right when we hit the shore; but we had commodious money belts stuffed with well-worn franc notes, too. The money helped us rent storage space, hire laborers to help Bob Myers' platoon of the 21st Chemical Decontamination Company set up the depot and collect supplies from the beaches for a hundred kilometers each way from Casablanca. As soon as the power driven decontaminators were in working order we sprayed the score of dirty, insect-infested one-story buildings The Force had taken over with strong solutions of bleaching powder. When the walls and floors had "sweetened" we washed the places out with clean water and whitewashed the inside and outside with the aid of a few converted 3-gallon decontaminators, which make excellent spray guns for this purpose when the nozzle is slightly modified. It was quite educational to find out what could be done with plenty of money, hard work, and a little ingenuity. We were later to learn that other incentives could be added to the list.

About the time the hardest work had been done, and The Western Task Force was set up to live comfortably in Casa-

Col. M. E. Barker

Colonel Barker, currently Head, Department of Chemical Engineering at the University of Arkansas, retired from active service in the Army in 1948. He began his career as a teacher of physics in the Philippines, was commissioned in the Coast Artillery in World War I, later transferred to the Chemical Warfare Service in which he held many important posts. Before going overseas in World War II he was Chief of Research & Engineering in the Office of the Chief. His last active duty assignment was Commandant of the Chemical Corps School. He was awarded the Legion of Merit and Oak Leaf Cluster. He has four college degrees, B.S., M.A., M.S., and D.Sc.—Ed.

Road signs at Santa Maria in November 1943. Depot 155 means a chemical depot number 55. The Black Cat, one of our crack British Divisions had been chasing the Germans of the double barbed arrow. The British signpainter always had their cat sitting on the German barbs—just to show how tough the cat really was.



This was The GOOD Machine shop at Capua. Ten days later this room was turning out locking forks, elevating bands, and other useful parts then in short supply.

blanca and to enjoy the really excellent winter climate of Morocco, orders came for me to select some forty clerks and technicians then proceed at once with them to Oujda and help organize the Fifth Army. The army was still a baby when Lieutenant General Mark Clark gave the staff some facts of life by saying, "The job of the Fifth Army is to kill Krauts. Your job is to get the men and the things that the fighting commanders think they need to do that job." It was impossible to imagine all the things we would do in the next two years to carry out those instructions; but it might be of interest to recount a few of them, because history has a way of repeating itself.

I had been in Oujda less than a week when a man in German pay tried to blow up the train from Oran bringing in supplies and troops. I had to play the part of a scientific detective and help convict the man and watch him executed. I found that a fellow can work real hard when his own skin is at stake.

Fire Bombs For The Air Force

One of the most challenging jobs that came my way was when the Air Force asked for my services on loan to "fix-up" some fire-bombs for use against shipping in Tunesian harbors. Imagine being set down in Biskra, a resort town deep in the desert where there were two huge empty tourist hotels, plenty of date palms, and a well-riddled hangar and workshop at the edge of a desert airdrome and being told, "All you have to do is to fix up a couple of hundred fire bombs."

We had a French liaison plane and crew, an artillery observation plane, a B-25, two jeeps, a ¾-ton truck, and half a dozen Air Force and Ordnance mechanics in addition to the crews. The first thing that happened was a soaking rain, the like of which the old gray-beards had not seen in a long time. The B-25 and the ¾-ton truck got stuck in the mud as hopelessly as B'rer Rabbit on the tar baby; the d— Krauts shot down our two light planes; the Italians ventilated our hanger some more and messed up the truck and the B-25 with a lot of mud. After we buried our pals, the rest of us got real mad and went to work. We didn't make the best fire bombs in the world; but we did convert 250-gallon gasoline drums into bombs by welding-on 500-pound bomb fin assemblies and making sheet iron noses. The gasoline was thickened with natural rubber smoked sheets and we tied on a couple of bottles of black powder to a reduced burster. We proofed the bombs on a shallow salt lake some fifty miles south of Biskra. They worked and I was real glad to get back to the oasis town of Oujda, having learned that anger can sometimes get more work out of man than gold or decorations.

By the time the Sicilian invasion was in the detailed planning stage the 2nd, 83rd, and 84th Chemical Mortar Battalions had arrived in Africa and had headed for the hills of Algeria to train. The 41st Laboratory Company had been installed in a school building at Marnha, Algeria, some fifteen miles from Oujda and a lot of 4.2-inch mortar shells were rusting in their boxes near Arzew, where they had been brought ashore from lighters through salt spray.

The 2nd Battalion fired twenty of these shells and got one half hearted 'ploop.' Humphreyville was then General Patton's chemical officer and he wanted twenty thousand shells in good condition, waterproofed, for the initial supply over the landing beach. Now, there is nothing in the books which limits the duties of a Field Laboratory Company and the 41st claimed to be something extra special. I told the company commander, "We will set up an assembly line, dismantle the fuzes, clean and polish the fuze parts, waterproof the shells, and pack them up for Humphreyville."

"What does a mortar shell look like?" I was asked.

Lab Unit Rises to the Occasion

So, I took a couple of Ph.D., sergeants, and a professing lieutenant, and headed for the ammunition storage area where we found fifty thousand "loused-up" shells which the laboratory boys saw after they had been soaked in salt spray and allowed to stand in wooden boxes exposed to the dews and the salt air of the Arzew storage area. It wasn't a pretty sight. We experimented for a coupled of days, reworked a score of boxes and found that the shells functioned perfectly. Cleaning and reconditioning these shells was the job of the Oran Base depot company; but the order stood to give the fighting men the things they thought they needed. Those laboratory technicians knew more about cleaning and assembling mortar fuzes in three days than the men back in the factory; and these chaps, being smart cookies, soon had the brawny men of the Base Depot Company doing the heavy work. Our assembly line used a lot of gas-proof sacks, shoe impregnite, and asphalt to package and waterproof the lot. Humphreyville and the mortar battalions got excellent shells that gave no muzzle bursts and performed perfectly. The credit for this job certainly goes to the men of 41st. It's too bad that we had

to save a dollar in packaging fifty dollars worth of precious shells, but we live and learn. I was the goof who, back home in the office of The Chief, CWS, and as Director of Research and Engineering, had approved those packaging specifications when I bowed to the economy-minded procurement people. So the cables that went back were straight to the point. As I said, one lives and learns and the object lesson here was to find a man to boss the job, give him authority and support, and help where necessary to get the job done.

Compared to Tunesia, and later to Italy, the Sicilian campaign was pretty mild. The two mortar battalions engaged in the operation fired just twice as many rounds during the entire campaign as the 2nd was later to fire in one morning at Ninturno (12,000 rounds). However, General Patton raced over the country like Stonewall Jackson's foot cavalry in the Valley Campaign, and pulling loaded mortar carts over the mule paths of Mount Etna was no picnic. It was a whirlwind campaign instead of a slugging match such as we found in Italy.

We were getting pasted from both flanks, from the hills to our front, and from the skies above at Salerno, when the 24th Chemical Decontaminating Company arrived. Al Gruenther, then Chief of Staff of the Fifth Army,* called me in and said, "These men are not worth their feed here. What are you going to do with them?"

"I'll make a smoke generator company out of them," I replied after having had a flash of genius (according to patent law) and a relapse from common sense.

"Good!" Al replied. "Have them ready to smoke the beaches by tomorrow night." Just like that. No ifs, ands, or buts.

Decon Men Learn Smoke Making—Fast

The Navy had landed twenty Besler smoke generators on the beaches and they were in the chemical supply dump to replace damaged and burned out generators on their crafts. A little fast trading with the Navy secured title to this bunch of packaged freight and we held school for the rest of that day. As night approached the Beslers were still in their crates. Lieutenant Waters, who commanded the 24th, was an able and aggressive officer but he could not perform miracles. The time for the nightly bombing raid on our supply beaches was not many hours in the future when we forgot the Beslers and distributed truck-loads of smoke pots. We taught the officers and men the trick of placing these munitions on their sides in shallow trenches with the head of one pot against the bottom of the preceeding one. We had the men prepare half a dozen rows at each of the firing locations and then return to their bivouac area in an apple orchard. Waters' cooks served a good, filling meal. A Jewish chaplain's assistant played on a portable organ, a Catholic chaplain said a few words, then all together the men repeated the Lord's Prayer and sang a couple of songs with more fervor than I have heard before or since. After that they headed for their assigned positions and "Made Smoke" when the order came through.

The next night the Beslers were in position, for we had really "taught school" that day. If I could get up that much enthusiasm in myself and my students these days we could "Knock Off" Unit Operations in a week instead of a year. There is nothing like enemy bombs and shells to inspire students to learn fast.

After we had gotten out of that hellhole called Salerno, and had taken Naples, we found a problem there that required a solution. There was one small water line coming into Naples from Vesuvio and a great main from the watershed to the north where the Krauts still held. Of course the main was empty. Besides that, the streets and sidewalks were littered with human dung, and dead people were plentiful—some of them very dead. Waters was ordered to leave his Beslers at Salerno and come to Naples post-haste with his trucks and decontaminators all loaded with chloride of lime. The 24th was bivouaced in a small park and half the power driven decontaminators were put to work hauling water from a nice clear mountain stream at Vesuvio and delivering it to the billets of the 82nd Airborn Division then holding Naples.

Supplying Water At Naples

We had to have armed guards on the trucks to protect them from the water-starved population. The remainder of the "decons" hauled water and mixed it with chloride of lime to spray the sources of the sickening stench that covered the waterfront area like a gas cloud. The trucks and "decons" never stopped rolling for a week, and Waters' men proved their value once more. As soon as water filled the mains, the 24th recovered their Beslers and joined the smoke defenses of Naples, now 1,100 strong, and capable of covering the waterfront of fifteen miles, and the islands of the bay, from Terra Annunziata to Pozzuoli in three minutes after the order was given. They did this on an average of three times each night, again proving that the name of chemical company does not limit its usefulness in war when the unit is well led.

One more instance of the varied work tasks that fall to the lot of the chemical officer in the field might be of interest. We had pushed the Krauts north across the Volturno and they were fighting for every inch of the ground between that river and their winter line through Cassino. The British Eighth Army was on our right and the Polish Corps beyond them as we faced north. On one trip to the front I left the sunny plains, and passed through rain, sleet and snow on the way up. We had captured a very interesting letter from a Kraut general to his wife complaining about the layer-effect of the weather, so my experience was nothing unusual, but that kind of weather was mighty hard on our ammunition which was stacked out in the open, and still inadequately waterproofed. The soft, gooey clay soil, filled with rocks, was even harder on our mortar parts and baseplates. Consequently our powder got wet and our mortar baseplates broke to pieces along with elevating bands and everything else except the mortar barrels.

After one leaves Napoli going north he comes to Caserta, where the great king's palace stands with its 1,200 rooms that had housed the Royal Air Force Academy. Beyond that is a cross-roads town called Santa Maria, and a few miles to the north, and on the south bank of the Volturno is Capua, the location of a great Italian arsenal. Here they manufactured fuzes of all kinds, tested and blended propellant powders, repaired artillery, and had all kinds of stores and gadget manufacture, employing several thousand persons in normal times.

Takes Over Wrecked Arsenal

Our bombers had destroyed the place completely, they said; and our artillery had redestroyed it. After our advancing troops took the place, the Kraut artillery tried their hand. Fortunately the Germans did not destroy the bridge over the Volturno and our engineers were able to repair it and get traffic moving shortly, but to protect it we placed smoke troops and plenty of AA artillery around it. This defense was too hot for most German bombers and they dropped their bombs on the arsenal. So it is easy to imagine the lack of enthusiasm Colonel Niblo, the Ordnance Officer, and I displayed when Al Gruenther called us in his office at Caserta and made us a present of the arsenal with the suggestion that we get it operating to supply some of our scarce items. It was just like making us a present of a ten million dollar rubble heap, without workers and filled with broken machines.

Niblo and I made a hurried inspection of the place and divided it into two approximately equal parts, each one insisting that the other fellow take more than his half. My part contained the nonferrous foundry, the pattern shop, two large machine shops, and several sets of living quarters. Fortunately, the guard barracks and the kitchen for the secur-

*Now 4-Star General in Command of Allied Forces in Europe.—Ed.

ity detachment had only one hole in the roof made by a dud bomb. The remainder of the place certainly looked like Air Force Reconnaissance had been telling the truth.

Captain Galagher's 11th Chemical Maintenance Company had its hands full up front so, for this job, I borrowed Lieutenant Nortorangelo and a detachment from the 12th, then belonging to Colonel Coblentz at Naples Base Section, and added such men as I could scrounge from the 6th Depot Company and the personnel center, and also brought up a platoon from Waters' redoutable 24th Decon. Company to serve as security guards. Plenty of 'Lire' induced the superintendent of the machine shop to come to work for us, and he soon rounded up a hundred or so skilled workmen and as many laborers. Some more 'Lire' stimulated memories and certain storerooms were found to be intact and to contain valuable supplies of metals and tool parts. We stripped one of the machine shops of all unbroken parts, cleaned out the other building and put on tarpaulin roofs, cannabalized some machines, made parts for others, ransacked the supply stores for still more parts, and in ten days we had the foundry working, the pattern shop ready to go, and the machine shop had an assortment of lathes, drill presses, milling machines and grinders in working order. We set up the Hobart Electric Welder and brought up some tools from the supplies in Naples. Our power plant was strictly international in scope, with the power being supplied by a Chrysler engine swapped for from the Navy. The captured German generator was pulled by the Chrysler, while the power was passed through an Italian distribution panel onto three aluminum cables strung on steel posts, both of which had been salvaged from the railroad torn up by the retreating Germans.

Casting Parts to Repair Mortars

Notorangelo could speak a little Italian. I could read it, but not speak it. Fortunately we found a patternmaker who could read and speak English quite well and he was most useful. Our men worked along with the Italians without friction and in a very short time the patternmakers had turned out exact models of the things we needed. They first made the model in wood, a trifle large, then made an aluminum casting from that model and machined and sculptured the aluminum into the exact form desired. The foundrymen had a secret mixture composed of a special clay, coke powder, and some other stuff which they used to make the molds and their products had the most minute tool marks of the aluminum pattern. We had a great pile of broken bronze elevating bands from 4.2 mortars which went back into the melting pot along with some more tin, a bit of aluminum to deoxidize the melt, and presto, we had new elevating bands, a pound or so heavier than the American models, but much stronger and tougher. Only a little hand polishing was needed to put these bands on the weapons and get them to firing once more. The machine shop turned out locking forks and many other machined parts. By the first of December our part of the Capua Arsenal was operating smoothly and producing thousands of parts at about half the catalogue price of American parts.

Lieutenant Notorangelo wasn't too cheerful over the morning's delivery of mortar parts to be 'Fixed' or replaced. Sometimes a baseplate got so beat up that we had to use it for covers to our fox hole entranceways, but not often.

After our shortages were alleviated and the four mortar battalions had their full complement of mortars in operation once more we started to work over all incoming baseplates and bipods, and to add additional angle iron braces where our experience had taught us that more strength was needed.

While our arsenal was getting into operation, the 11th Maintenance Company set up a depot and a base Ammunition Supply Point in the mountains not too far from Venafro. The constant rain and snow of the mountains made it imperative that our powder be dried out and kept dry, for the new cartons in which the shells arrived were far from airtight or resistant against water vapor. I designed a powder dryer made of sheet metal and arranged so that trays of powder bundles could be slipped over wooden sticks and the racks holding these masses of powder could be slipped into the dryer which was heated with steam coils salvaged from two broken M-1 smoke generators, hot air blown in by a Collective Protector (CWS apparatus designed to filter incoming air for a gas shelter). After the powder was thoroughly dry we packaged it in dry 88-mm German packing cases, or in Nebelwerfer cases, which were both vapor and water tight. After that, the powder and shells were issued separately to the battalions with the elimination of poop-outs. The 11th Maintenance Company built the dryer generally according to my design, with some improvements, and operated it without an accident for three months. In addition, they set up an assembly line operation in a hospital tent where every incoming

(Continued on page 27)

Combat Smoke in Korea

By LIEUTENANT COLONEL JOHN A. MARTIN
Chemical Section, Headquarters
United States Army Forces, Far East

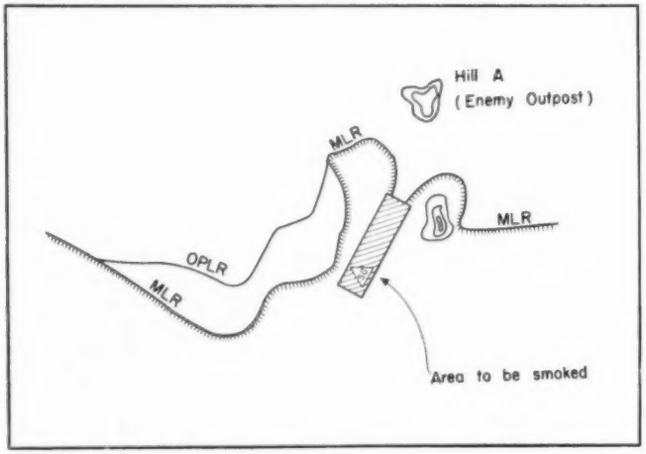
EDITORS NOTE: In this article, written shortly before signing of the Truce, Colonel Martin describes for Journal readers some of the actual operations of Chemical Corps smoke generator units in support of our forces in Korea.

Smoke missions in direct support of combat operations in Korea have proved once again that here is a weapon of great versatility and adaptability. In this rugged, mountainous country where for two years the opposing outposts have faced each other across small valleys from adjacent hills, the battles have been for the hills with the best view of enemy positions. And in this struggle for the dominating terrain, smoke has been put to constant and invaluable use.

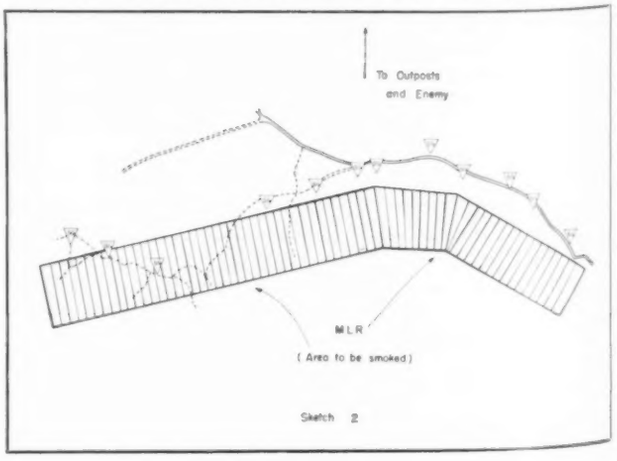
No longer are we thinking in terms of large armies on the move, or an entire company smoking a division river crossing on a several mile front. Here we have smoke generator companies broken up into small units, hours or days apart over the difficult roads, with three or four generators smoking a vital crossroads a few hundred feet behind the MLR (Main Line of Resistence) day after day under artillery fire. Or two generators on a mountain top covering the construction of a communication trench, while the enemy on a higher hill look down their throats. Or setting out smoke pots in front of the MLR, where POL (petroleum, oil and lubricants) supplies for generators cannot be carried.

New uses for smoke? No. Just concentrated and efficient, at times almost exhausting, adaptation of weapons capabilities to meet the combat needs of the "non-typical"

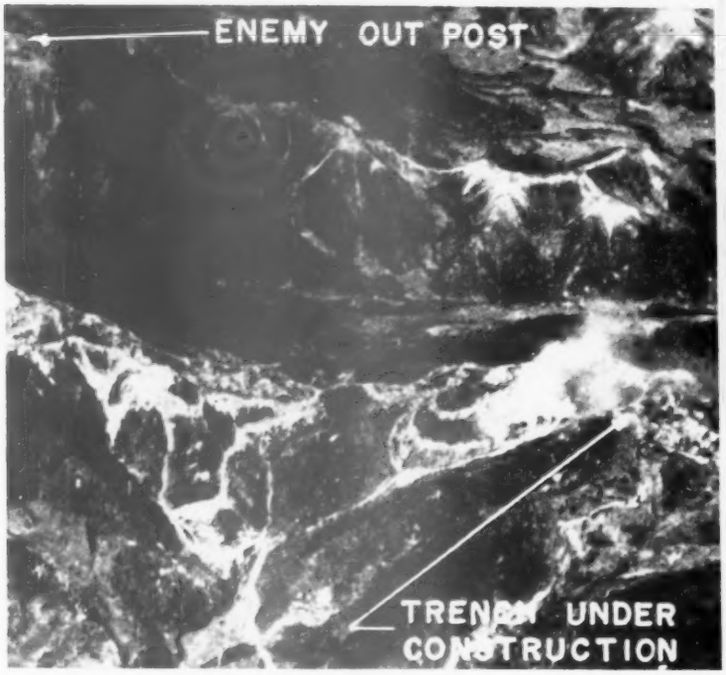
Sketch shows the use of one smoke generator to screen a critical pass from enemy observation thus facilitating supply of our forces.



Use of 12 smoke generators to screen the operations of an infantry regiment in organizing its Main Line of Resistance over a front of 3½ miles.



Type of warning sign sometimes used by smoke units to supplement guards at critical areas.



Air view showing smoke by chemical unit to screen trench construction operations.

war in Korea. Protection of static artillery, smoking of vital supply routes, covering road construction and bridge-building, screening the laying of barbed wire entanglements, covering the withdrawal of large size patrols with WP (white phosphorus) artillery shells, recovery of wounded, movement of tanks, artillery and infantry into exposed positions, recovery of disabled tanks, protection of outposts from artillery fire, screening from sniper fire—these are missions performed by smoke in Korea. Nothing startlingly new in tactics, but used to the maximum capabilities of the units available. The scale of operations is indicated by the fact that the 388th Chemical Smoke Generator Company alone, operating in widely scattered missions in support of three U. S. Corps, consumed well over a million gallons of fog oil in the six months period of September 1952 through February 1953. Operations during this period amounted to over 22,000 generator hours, and far exceeds what is believed to be the previous high for a similar period when the 172nd Smoke Generator Company operated 13,456 generator hours during a seven months period in Italy in 1944-45.

Colored Smokes Also Used

Colored smokes, too, have been employed to good effect. Grenades have been used for air-to-ground identification, marking of helicopter fields for evacuation of wounded, and identifying patrols; the artillery has used colored smoke shells for artillery registration and to mark targets for air attack. Some ROKA units actually preferred colored smokes to WP for covering the withdrawal of personnel, as the colored smoke persisted longer than the WP.

Typical of the small and "one-time" missions was the operation called Ethiopian Outpost, which took place in IX U. S. Corps in October of last year. The mission of this operation was to provide a smoke haze to cover the establishment of an outpost line to the MLR. The area under observation was covered with smoke from two generators during daylight hours for two days, by which time all necessary construction was completed.

In an even smaller but vital mission one generator only was required to prevent enemy observation from Hill A (Sketch 1) through a pass separating friendly MLR positions. Through this pass, if not screened, the enemy had direct observation of vital roads used to supply the surrounding MLR. This mission was of indefinite duration, continuing as long as Hill A was held by the enemy.

Most missions have required slightly larger effort, as in the————Valley operation. The first of its type for the smoke unit, this operation provided coverage of the area from enemy direct ground observation while a regiment constructed fortifications along its entire three and a half mile front. As shown in Sketch 2, twelve M2 smoke generators were required, and smoke was provided during all daylight hours for seven days.

An important concept, re-emphasized as a result of an inadequate number of smoke generator units to fill the demand for front line protection, is that smoke pots can be used alone or in conjunction with generators to cover vital bridges, equipment, or lines of communication. The smoke pots put up an immediate cloud, which can be maintained alone, or which can be discontinued when a smoke generator unit moves into position and builds up its screen. Smoke pots can also be used to cover from air attack CPs, ASPs and supply dumps for which it would not be practical to provide a smoke generator unit but which contain critical supplies for support of combat operations. This method of smoking by the "using unit" is particularly efficient as regards manpower, and has become more important with increased realization that U. S. supplies are not inexhaustible and must be protected even in combat areas.

Smoke to Cover Critical Road

To give the details of one typical mixed operation, four smoke generators, supplemented by smoke pots, were used to screen the construction of a road up to a mountain-top forward position, to be used for resupply of the position and evacuation of wounded. The screen was begun in mid-November, with complete coverage during daylight hours pro-

Training of Korean troops, attached to US Army, in use of the M3 smoke generator.

Jeep mounted M1

vided for the south approaches to the hill. Exit from the static generator positions was made under cover of a smoke pot screen, due to the advanced location of the area. The road was considered to be of major tactical importance, and upon completion still required smoke protection. The mission was therefore continued on an indefinite basis. Winter months made operations difficult, particularly for the supply of POL; and in the early spring the poor condition of roads necessitated for several days the use of an armored personnel carrier, towing a one-ton trailer with six drums of fog oil per load. At times even this could not reach generator positions. During this period heavy enemy mortar and artillery shelling of the area was frequent. During a night attack by the Chinese in April the hill was lost, but by morning it appeared that friendly troops had retaken it. A squad was therefore sent out to generator positions. Two attempts to enter the position were stopped by heavy enemy mortar and artillery fire, but finally during a lull in the firing the squad walked into position. Heavy enemy fire continued during the day, completely destroying one position and partially destroying another.

During the next three days the generator positions were rebuilt with the aid of the engineers, using smoke pots to continue the screen during the day, and working on the positions and bunkers during darkness. Action continued to be so heavy that all traffic through the area was stopped, except for personnel carriers and other armored vehicles. Smoke generator operators entered and left their positions on foot during darkness, and resupply was undertaken at night and under cover of the smoke screen during the day. The operation continued in this manner for some time, with smoke production restricted to early morning and late afternoon, since by then weather conditions prevented the establishment of an effective screen during the middle of the day. Daytime traffic over the road being screened was limited to the time the smoke was in operation.

It is already evident by visualizing the action described in these operations that security has become of major importance in planning and carrying out front line smoke missions. On numerous occasions smoke generator operators have been pinned down by enemy machine gun fire. Generator positions are usually operated from nearby bunkers, and sandbag revetments are built around the generators to provide adequate cover from direct enemy small arms fire while operators service the generators. In many advanced positions it has been necessary to have two men per position, both for security and for first-aid purposes. To off-set this reduction in the number of positions which can be operated, the volume of smoke from each position can be increased by operating two generators, provided the larger volume of smoke is useful to the over-all smoke coverage. The result of operating from these exposed positions has been a regular casualty list, of either killed or wounded in action, though the numbers have not been large. A spot of humor was injected on one occasion —at a time when the units were still classed as "3-point troops"—when an enemy soldier walked through the smoke screen into a generator position and surrendered.

Screening Artillery Positions

All missions are not so hazardous. Several of the most important operations have been the screening of static artillery positions. With the gun flashes covered from enemy observation from hilltop outposts, substantial reduction in the effectiveness of enemy counter artillery fire has been effected. Whole valleys have been covered for months with a light haze sufficient for this purpose. At the same time, exposed main supply routes are hidden from the enemy without obstructing our own vehicular movements. From five to twelve generators have been used for this type of mission, operating during all daylight hours in all types of weather. Only during heavy snowfall or rainfall has the smoke coverage been found unnecessary.

An important point in operations of the type so common in Korea—protection of static artillery, construction, main supply routes—is that the objective is to produce a smoke haze over the area just heavy enough to prevent enemy observation. Since air observation has not been a factor in the Korean war, direct ground observation has been the only consideration. The thickness of the haze required depends upon the distance away from the enemy, and weather conditions. Too

erator during tests of new equipment.

thick smoke must be avoided in order that friendly operations may continue unhampered under the smoke, and care must be exercised to avoid placing generators so close to roads as to obscure them completely.

Hilly and mountainous terrain always presents problems of wind direction when establishing smoke screens, and the Korean front is almost wholly this type of terrain. In covering an entire valley with smoke or haze, such as for protection of artillery, it is entirely possible to find four or five distinct wind directions in a one by three mile valley. Passes cause wind channels entirely at odds with the general wind current in the area; air will flow down the valley side of one hill, and on a neighboring hill may flow up, and winds may flow out of both ends of a valley. A not too unusual observation in one prolonged valley mission was smoke from five generators within a couple of hundred yards going in five different directions—four moving more or less along the ground, and the fifth rising straight up.

With such wind currents to cope with, flexibility in smoke plans is paramount. Instead of sampling the wind and establishing a smoke line, it becomes a question of placing each generator almost by trial and error so that the desired effect is obtained. Frequent shifts of position during a day are the rule. But where missions are continued day after day, patterns in the wind behavior are soon apparent, and SOPs for different conditions will usually apply. Constant observation is necessary, though, to ensure that compensation in generator positions for shifting winds are made promptly.

Elements Widely Separated

Drastic modifications in the organization and operational procedures have been made necessary by the far-flung missions of the smoke units. For many months the 388th Chemical Smoke Generator Company, commanded in turn by Captain Edward D. Hoffmann, Captain John W. Walker and Captain Vincent S. Luca, conducted all smoke generator missions for three U. S. Corps in Eighth Army. During the latter part of this period it was augmented with about 75% additional personnel and 100% additional M2 generators. Platoon CPs were located from three to eight hours away by jeep from company headquarters, and telephone communications were difficult, even impossible on occasion. Under these circumstances direct control of operations was passed to the platoon leader, with the company commander providing supervision through frequent visits to the platoon and giving maximum logistical and administrative support from company headquarters. Jeep and trailer courier service was provided to each platoon every other day. The outgoing run provided transportation for company or depot repaired generators, spare parts for platoon maintenance, personnel replacements, mail and miscellaneous supplies. The incoming trip from platoon to company headquarters returned generators which could not be repaired in platoon, personnel returning for R and R (rest and recuperation) or Big R (rotation), and occasional liaison visits of the platoon leader. POL supplies, including fog oil, were drawn by the platoons from the nearest QM POL supply point.

Under conditions such as these, maintenance quickly became the dominating factor affecting operations. Most generators in working order were run continuously for five to fourteen hours a day, and often under the most adverse weather conditions of rain, snow, ice and mud in the winter, and rain, mud and heat in the summer—and the ever present dust, winter and summer. This beating was almost too much for the old World War II M2 generators, with the result that about half the generators were out of action at all times for company or depot maintenance. Even the trips from the front to the depot and back, over the rough roads in a trailer, were damaging. Often a depot overhauled machine would arrive at platoon with road damage such that it would have to be returned by the same courier.

In view of the expanding demands for more smoke across the entire Eighth Army front, constant attention and priority handling were given to smoke generator repairs by all concerned. Most of the maintenance personnel, equipment and spare parts were transferred from company to platoons, and all possible maintenance was accomplished at platoon headquarters in order to avoid transporting the equipment over the mountain roads. This also decreased the time generators were out of action for repairs, and thus increased the percentage available for operation at any one time. Still, with all these efforts, the average hours of operation before an M2 generator was sent to depot maintenance was only about 30 to 35, and outstanding efforts by the chemical service companies in Korea, and chemical depot in Japan, were required to support the ever increasing calls for smoke.

It was early recognized, and continually apparent during these efforts to keep the smoke units in operation, that there was a serious shortage of maintenance experience at all echelons. Well-trained maintenance officers for the service companies and maintenance-trained smoke generator company officers were sorely needed and unavailable. Trained generator operators who realized the necessity for proper maintenance and trained maintenance men from the zone of interior would also have paid off in the field.

Maintenance Problems

Substitution of the new M3 smoke generators for the old worn-out M2s is expected to greatly decrease the maintenance demands on the chemical service companies. After a few months operation with M3s it is evident already that the majority of maintenance operations can be performed at platoon or company level.

(Continued on page 40)

Secretary Wilson at his desk in the Pentagon

A copy of this address was very kindly made available to the "Journal" by Secretary Wilson in response to a request to him from a member of the A.F.C.A. While it deals largely with the 1954 Defense Appropriation Bill which has since been passed, the Journal is pleased to print the address as a document of continued interest. It gives insight into Mr. Wilson's thinking and views on the defense situation and outlook for peace. We have supplied the title used here, derived from the opening paragraph.—Editor.

DEFENSE IS EVERYBODY'S JOB

Address of Secretary of Defense Charles E. Wilson
Before the Iowa State Bar Association
Sioux City, Iowa
June 5, 1953

Mr. President, Members of the Iowa State Bar Association and Guests:

I appreciate this opportunity to discuss with you our national defense program. Defense is not one man's job. It is not alone the Government's job. It is everybody's job. It is an organization job. It requires the interest, understanding and help of the millions of fine men and women who are in the Defense Department. It requires the understanding, financial and moral support not only of the Congress but of all Americans.

On the one hand there is no question but that an external threat of serious magnitude to our freedom and security exists. There can be no reasonable guarantee of survival until the military forces of the United States have been built up to a point where they can hurl back an aggressor and deal swift and certain retribution. On the other hand, a military build-up can be so costly that the impact on the nation's economy, especially if it must be continued for a long time, could destroy the very liberties that we seek to defend. Stated in simple terms, the answer is clear: we must increase the effectiveness of our defenses while decreasing their cost.

While this is a simple and clear statement of the problem it is not an easy thing to do. The results can only be achieved if the overall plan is good, if all the activities of the Department of Defense are well organized, and if all those in the organization attack the problem with spirit and determination. The final results will come as thousands, yes millions, of things are analyzed item by item and a more efficient and effective solution found for working them out. This requires a great deal of patience and understanding and takes time. We face the alternative of loss of our liberties through external aggression or the loss of our liberties through the deterioration of our economic system, unless we do find adequate solutions to our basic problem of increasing the effectiveness of our defenses while decreasing their costs. The present Defense Department is devoting itself to this difficult task.

New Look At Defense Picture

We are reexamining all of the activities and objectives of the Defense Department and realize that this reexamination must be made with determination, imagination and an open mind. We realize that we may have to strip away the tough outer lining of military tradition and do away with obsolete methods of organization and of doing business wherever found.

During the summer and fall of this year, it is planned to take a new look at the entire defense picture, particularly from a military point of view. This will involve an intensive and detailed study by the newly-confirmed Joint Chiefs of Staff. They will consider all aspects of defense—missions, strategic plans, forces, weapons, readiness levels and mobilization reserves, both stockpiles of materiel and capacity to produce. The current force plans are subject to whatever change may be indicated by this forthcoming review after they have been considered by the National Security Council and approved by the President. This will provide the basis for the fiscal year 1955 budget.

The fact that a review is indicated at this time is no criticism of past policies and recommendations but simply a recognition that time has gone by and that conditions change. We have been particularly fortunate in the military chiefs who have helped to develop our present military policies.

I have great confidence in the newly confirmed Joint Chiefs of Staff—Admiral Radford, General Ridgway, Admiral Carney and General Twining. They are men of ability who will, I am sure, approach this important matter objectively and without prejudice.

I have always been a little prejudiced in favor of a man who did his work well no matter what his job happened to be—workman or executive—enlisted man or officer. At the same time I have short patience with those whose actions are based on prejudice and whose opinions are not based on facts. I hope that all Americans, both military and civilian, will

(Continued on page 26)

SECRETARY WILSON'S ADDRESS

(Continued from page 24)

remember we fight under one flag. In Korea, where our brave soldiers, sailors, marines and airmen are fighting to defend the free world, this is no problem. They know they fight under one flag and for one purpose. While we are negotiating for an honorable truce in Korea, our hearts are with the men and women who are fighting in the meantime. Even if a truce in Korea is finally achieved, the fundamental danger is not passed. It should be a comforting thought to the American people that we now have the finest trained and best equipped armed services in our history except when this country has been under full mobilization. Under our present plans this military strength will continue to increase.

I am surprised that controversy has developed over the fact that the Defense Department has reduced its request for funds for fiscal year 54 by more than five billion dollars. After a careful analysis of the problem we decided that this was all the additional funds we needed. Due to the big carry-over of funds from previous appropriations we did not think we should ask the Congress for more money at this time than we needed. Apparently, I am in the peculiar position of a son who goes to his dad for money and his dad insists on the son taking more money than he wants or needs or even thinks is good for him.

Security Is Above Politics

The security of our country is above and beyond partisan politics. I believe that the Congress really feels the same way. This must be so, for at this stage in the budget review I find some Democrats who seem to be for the Administration's budget and some Republicans who seem to be against it. I have watched the hearings so far with great interest. I am sure that the better the defense problems are understood the less controversy there will be about them. The Defense Department welcomes discussion and criticism regardless of source so long as it is objective and constructive.

The total budget request for fiscal year 54 now before the Congress is 36.04 billion dollars. This budget is 5.26 billion dollars less than the budget presented by the previous Administration. This new budget request is based on security first and economy second. It recognizes certain over-funding in the January budget request, particularly for excess funds for the Air Force.

In our revision of the budget the previous request of the Army was increased from 12.1 billion dollars to 13.7 billion dollars to provide for additional ammunition and the equipping of additional Republic of Korea divisions, although the Army made substantial savings in other categories. The request for the Navy was decreased from 11.4 billion dollars to 9.6 billion dollars, and the request for funds for the Air Force was decreased from 16.8 billion dollars to 11.7 billion dollars.

Our military program calls for the maintenance during fiscal year 1954 of the basic combat forces presently in being in the Army and Navy but with their military effectiveness improved by substantially increased modernization of equipment. In the case of the Air Force, substantially increased combat effectiveness will be achieved both through continued modernization of equipment and by a substantial build-up in the number of combat wings having full equipment.

Through better utilization of manpower but with no reduction in combat personnel we expect the Army to reduce its personnel from the level of March 1, 1953, by 74,000, the Navy and the Marine Corps by 70,000, but the Air Force by only 5,000 due to the fact that we expect to increase the number of wings in the Air Force.

Reasons For Cutting Air Funds

The aircraft schedule now in effect is the one made up by the Air Force and approved last October. The fiscal year 1954 budget request submitted in January was based on this schedule with but minor changes. Month by month this schedule in total has not been met, the loss of production or slippage for various reasons being an average of approximately 12% for all aircraft and 22% for combat aircraft. While this schedule has not been officially changed, revisions have been under consideration in recent months, and a new schedule has just been adopted. The new schedule, which will become effective July 1st, will call for at least as many combat aircraft for fiscal year 1954 as did the schedule made out last October. We hope not only that this production schedule of combat aircraft will be made but that we will be able to produce at least 75 of the combat aircraft scheduled in the past year but not delivered.

We hope that by concentrating on engineering and production difficulties we will actually make this new production schedule. We informed the aircraft manufacturers who came to Washington Tuesday to discuss this schedule that this schedule must be met, and we expected them to do it. If this is accomplished, it will be the first time that a monthly aircraft schedule in total has been made since the outbreak of the Korean war. This should give our Air Force rapidly increasing combat effectiveness both through modernization and increase in actual numbers of modern planes. It will give our pilots the kind of planes they should have whether they are called up to fight in Korea or elsewhere.

The relatively large reduction in the funds being requested for the Air Force has been made for two reasons. The Air Force has available to it substantial carry-over funds for aircraft from previous appropriations. We also know that planes now in production no longer have to be ordered so far ahead. This shorter-commitment type of planning will not only reduce the funds required but will also save money. Equally important, it will make it possible to promptly put into effect new military plans approved by the National Security Council after the study which the new Joint Chiefs of Staff will make this fall.

The reduction in the Air Force budget is not an indication that we believe that air power is any less important. It does not mean that we have lost confidence in the Strategic Air Force as a vital deterrent to aggression and as a decisive striking force in case war is forced upon us. Neither does it mean that the Air Force budget has been cut to favor either of the other services. Including the new budget requests and the carry-over funds, the Navy will have available 26.51 billion dollars, the Army 30.73 billion dollars, and the Air Force 40.17 billion dollars. The funds available to the Air Force are ample to continue a rapid build-up in its effective strength.

Strongest Air Force, Marvelous Airmen

We especially recognize the great importance of developing new and better types of airplanes for production in future years, of providing substantial sums for research and developments so this can be done, and of bringing these superior models into production as soon as their superior merits have been proven. No development projects for combat-type aircraft have been eliminated, and no other worthwhile development projects have been eliminated for lack of funds.

Air power available for the defense of this nation must include not only the aircraft in the Air Force but also the aircraft in the Navy and the Marines. The quality of the planes and the capability of the pilots who fly them must be taken into account as well as the number of planes. While our Air Force is still not what we would like to have it, nor what it is going to be, I believe it is now the strongest, most powerful air force in the world today. Not only is our equipment rapidly improving but our airmen are marvelous. The combat accomplishments of our pilots in Korea are evidence of this fact.

Military expenditures are a heavy drain on the economy of the nation and a burden on all the people. Therefore, we have an added responsibility of carefully reviewing the matter each

(Continued on page 54)

Our Chemical Maintenance shop at Anzio that bore a charmed life for a long time. "Anzio Annie" got this pretty villa in the end.

We learned something about mud in Sunny Italy. Outdoor storage for considerable periods under such conditions requires real packaging. This was ASP 414 and Depot C-16 in the vicinity of Venafro-San Pietro.

WAR IS NOT ALL FIGHTING

(Continued from page 19)

shell was unboxed, the fuze dismantled and the parts cleaned and then properly assembled. In one batch of 20,000 shells we found 11 fuzes that in all probalility would have caused accidents.

More Jobs For the Arsenal

It was a good thing we had the arsenal and the ASP in operation by Christmas of 1943 for shortly before that date the great underground storage system in the mountain under the abbey at Naples went up in smoke that rivalled Vesuvio. 80,000 WP-filled mortar shells was one small item of the supplies that were destroyed in this accident. That made it necessary for us to use whatever supplies we had in the Fifth Army until additional material arrived from the United States.

The mortar battalions were not our only customers at the Capua Arsenal for we had to modify practically all the M-1 and Besler smoke generators on the line at Napoli, and all new arrivals, to make it possible to recycle the hot oil instead of burning it. This made for a controlled smoke screen and reduced our oil consumption by as much as five thousand gallons per night. That is a lot of oil to save but we had the 24th, the 163rd, 164th, 168th, 172nd and the 179th Smoke Generator Companies on the line as well as half of a British Smoke Generator Battalion. These operators, with the help of Kraut airmen and local snipers, kept a lot of generators in the repair shop.

After the Anzio operation got under way I had to send a strong detachment of the 11th up there and take away all the soldiers from the Capua Arsenal. Claude Merrill became commanding officer of the arsenal with Italian civilians as his labor and security force. He did a fine job and got to jabbering Italian quite readily. At the Anzio beachhead the maintenance detachment had to repeat the work that had been done at ASP 414 in the mountains. We selected a pretty concrete villa of six rooms, setting a little apart from other houses, on a little hill outside the town of Nettuna, principally because this house had very heavy concrete floors and large rooms. The welder was set up in the kitchen. The living room became a machine shop. One of the bedrooms became a parts storeroom, and the other rooms served useful purposes, but the men slept in fox-holes even in the rainest of weather. Bombs and "Anzio Annie," the big railroad guns of the Krauts, made rubble of all the buildings in a quarter of a mile of our pretty maintenance shop and one afternoon it struck me that we had stretched our luck far enough. I'll tell you the sequel after disgressing a bit to describe three other jobs that were a bit different.

Joe Martin came to my tent in an olive grove north of Caserta one morning to shoot the breeze, but I knew that sharp medical officer of the Fifth Army wanted something. Finally it came out that his hospital tents all over the southern half of Italy were leaking. There had been so much rain that the waterproofing had washed out. All Joe wanted us to do was to waterproof his hundreds of tents as they stood, and without bothering his patients. We worked out the details and furnished the shoe impregnite for the job, but persuaded the Quartermaster that his men should do the work under our supervision.

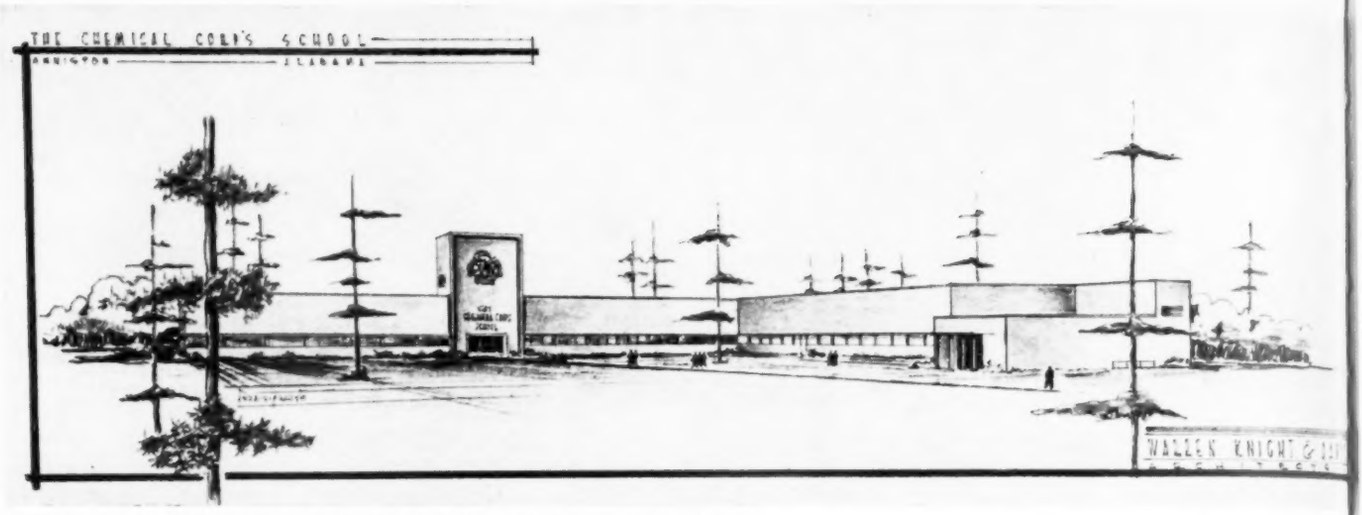
General Mike O'Daniel of the 3rd Division had a somewhat analogous problem, but Mike took the direct approach. He called me up and told me what he wanted, then sent Captain Albert Safine, his chemical officer, up to help do the job. His tents and camouflage nets had lost all fire retardent properties due to the rains, Mike said, so all he wanted was to "have them fixed." You can't do that with shoe impregnite.

General "Willie" Wilbur of the 36th Division sent word that he wanted a 4.2 mortar mounted on an M-7 half track and provided with 50 rounds of WP and 20 rounds of HE and a gun crew trained and furnished to operate the weapon. General Wilbur gave the Ordnance Officer (Colonel Niblo) and me three days to get his new weapon ready. An unlucky lieutenant by the name of Bagieletto and four enlisted men from the 2nd Mortar Battalion happened to be in my office for their orders and for transportation to the rest center with the 'Request' come through. They promptly got the detail. The 11th Chemical Maintenance and the 82nd Ordnance Heavy Maintenance companies got the job. Off came the howitzer and on went the mortar. Bagieletto and his crew took it out to fire a problem and learn to drive the thing, moved up to the front under cover of darkness and fired a mission that was so successful that General Wilbur sent his Ordnance Officer (Major Green) to tell us about it.

Now to come back to my interrupted story of the 11th Maintenance Company on Anzio. When these men had first landed they acquired a cow named Rosie for the sum of five bucks and a dozen chickens. While generals ate egg powder, these 11th Maintenance boys had fresh eggs for breakfast twice a week, and cream for their coffee every morning. At night, for protection, they had been keeping their livestock in two caves.

On this day about which I decided that our luck had about run out I ordered the shop set up in the big cave while the generator for the Hobart Welder was stowed in the little cave. The men obeyed like good soldiers. During the night we had a massive bombing attack supported by Anzio Annie and her little sisters. A bomb fragment killed Rosie. A direct hit on the villa made a shambles of the place.

The detachment mourned Rosie's passing; but they ate her just the same and sold enough beef to get their capital back with interest. The sergeant said, "It's bad enough to have Rosie killed; but how in the hell could we have fought the war if the welder had been smashed."



Architect's drawing of the new home for The Chemical Corps School now under construction. (U. S. Army Photo)

COL. J. R. BURNS
C.O., Training Command

COL. EDWIN VAN KEUREN
Commandant of the School

On one of the lesser foothills of the Appalachian Mountains, the "Hill" at Fort McClellan, Alabama, stands The Chemical Corps School. Its mission is the training of officers and enlisted men of our own and friendly armed forces in the intracacies of modern chemical, biological and radiological warfare. The Chemical Corps School is an outstanding example of interservice co-operation and unification of effort.

The ever-continuing expansion of Chemical Corps activities has brought a corresponding need for larger facilities. By the end of 1954 the Chemical Corps School together with the headquarters of the Chemical Corps Training Command will have moved off the "Hill" and into new buildings now under construction on a site one-half mile away. The School will be quartered in a two-story reinforced-concrete, L-shaped building designed especially for its particular needs. Air conditioned and provided with ample classroom and laboratory space, the building will also house an auditorium and will be near two auxiliary structures containing, respectively, a radiation detection laboratory and a decontamination unit.

First established as the Chemical Warfare School at Lake-

"LET US RULE THE BATTLE BY MEANS OF THE ELEMENTS"

By

2ND LT. JOHN P. BANJAK
AND PVT. AARON ASHER

Here the Public Information Staff of the Training Command, Fort McClellan, Alabama, tell about The Chemical Corps School and describe briefly the new, specially designed school building now under construction.

In Foreground, new school building under construction.

hurst Proving Ground, New Jersey in January 1920, the School has graduated more than 40,000 students. Its graduates represent all arms and services of the U. S. Army; personnel from the Navy, Air Force, Marine Corps, Coast Guard and Public Health Service including the WAC, WAVES and SPARS, and also representatives of the armed forces of various foreign governments.

The School was moved from Lakehurst to Edgewood Arsenal, Maryland in 1920 and from there, in 1951, to Fort McClellan, Ala. It is one of the elements of the Chemical Corps Training Command with headquarters at Fort McClellan headed by Colonel J. R. Burns. In 1946, in line in the change in the name of the chemical warfare branch of the Army from The Chemical Warfare Service to The Chemical Corps, the School was re-named The Chemical Corps School. In the passing years its curriculum has broadened and today it covers the three aspects of war denoted by the Army's abbreviation CBR—chemical, biological and radiological warfare.

Working with books, test tubes and radiation detection instruments in the classrooms and laboratories, the students also engage in field exercises where the "tools of the trade" range from smoke generators and flame throwers to delicate instruments for recording invisible effects produced by the breakdown of atoms.

In addition to full provisions for resident classes, the School has an Extension Branch. This Branch provides instruction through correspondence to personnel of all components of the Department of Defense in all parts of the World and assists in U. S. Army Reserve School and R.O.T.C. training in the Chemical Corps field.

The present commandant of the School, who was appointed last March, is Colonel Edwin Van Keuren. He has served two tours of duty in the Far East. During World War II he was chemical officer on Iwo Jima and also served as information and education officer on Saipan. More recently he served as commanding officer of Camp Gifu, Japan, and commandant of the Far East Command Chemical Corps School there. He has a doctor's degree in education and in civil life held positions as high school principal and superintendent of schools.

Three general types of courses are given at the Chemical Corps School; basic and advanced courses for officers and enlisted men of the Chemical corps; courses for personnel of other branches to prepare them for duty as unit CBR officers or non-commissioned officers; and courses to train various specialists.

In the last category is the six-week Atomic Defense Officer Course monitored by the Armed Forces Special Weapons Project. This course, for Army, Navy and Air Force officers, includes a review of the basic sciences and nuclear physics, radiac (detection) instruments and preparation of atomic defense plans and training programs.

Intensive and detailed instruction in the occupational specialties of the Corps is given at the School to both officers and enlisted men of the Chemical Corps. The highest level of instruction is the Advanced Course for Chemical Corps officers. Covering 35 weeks, this course is designed to prepare selected officers for key staff or command positions. Class work, which covers a wide range of subjects of common Army concern, as well as subjects in the particular field of the Corps, is supplemented by trips to Armed Forces installations throughout the country. A recent class visited Fort Benning, Ga., Elgin Field, Fla., Dugway Proving Ground, Utah, Rocky Mountain Arsenal, Colo., Pine Bluff Arsenal, Ark., and Camp Pickett, Va.

Other courses for Chemical Corps personnel include the Chemical Officer Basic Course of 15 weeks, and courses of shorter duration for enlisted specialists, namely the Chemical Staff Specialist, Chemical Supply, Chemical Laboratory, Smoke Generator Operations, Decontamination Equipment Operations, Impregnating Equipment Operations and Protective Mask Repair Courses.

The course for training personnel of other branches as CBR specialists for units, for instance as CBR officers of Infantry regiments or battalions, is of four weeks duration and includes methods of training of troops in CBR defense measures.

In addition to these courses there is the Navy ABCD Course administered by the School Naval Unit presently under Commander Claude O. Morrison. This course of four weeks duration provides instruction in atomic, biological and chemical defense measures with particular reference to Naval applications. It is designed for Line and non-medical staff officers of the Navy and Naval Reserve, Coast Guard and Public Health Service personnel, and certain civilian employees of the Department of the Navy.

In recent months foreign students from the armed forces of Great Britain, The Netherlands, Canada and South Korea have attended the Chemical Corps School.

In addition to instruction, a large part of the School's program is devoted to preparing training literature and manuals on doctrine and technique.

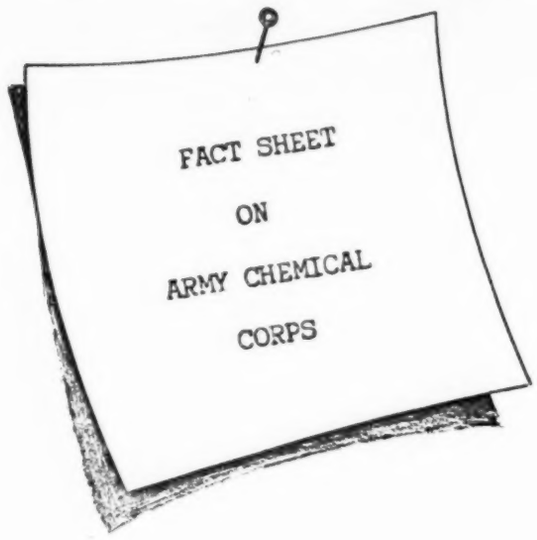
Important work as chemical, physical and biological research assistants is being done by a group of enlisted men at the School under the Army's Scientific and Professional Personnel program. This is a program to make use of the civilian training and skills of young men who enter the service upon completion of their university or college courses.

The motto of the school is: Elementis Regamus Proelium—*Let Us Rule the Battle by Means of the Elements.*

An example of inter-service and international teamwork. Officers of the Marine Corps, Navy, and South Korean army are shown on a radiation detection exercise at the Chemical Corps School. (U.S. Army Photo)

Chemical Corps School students buttoning up their impregnated clothing as they prepare to enter a simulated gas-contaminated area. (U.S. Army Photo)

Hands across two seas. Colonel Edwin Van Keuren, center, commandant, introduces student officer from The Netherlands and officer from South Korea. (U.S. Army Photo)



The greatly broadened mission of the Army Chemical Corps in the National Defense program, since the establishment of this branch of the service 33 years ago, and listing of some of its important contributions to human welfare, are reflected in the following press release, here printed in full, issued by the Department of Defense on July 25, 1953:

Background of Chemical Warfare

Historically, chemical warfare predates practically all forms of modern combat. Since flame warfare is considered a part of the chemical field in the modern sense, the caveman who used hot coals and burning faggots to keep the animals from his home can be considered an early user of chemical warfare. The writings of Kautilya and Ramayana in 2,000 B. C. about the wars of ancient India mention smoke screens, incindiaries, and fumes that caused "slumber" or "prolonged yawning." Noxious fumes, although crude in the modern sense, played an important part in many ancient battles.

Despite this air of antiquity about chemical warfare, modern gas warfare did not come into being until April 22, 1915, when the Germans unleashed chlorine gas from 1200 cylinders on the western front near Ypres, Belgium. The results were dramatic—more than 5,000 casualties among the French and Canadian troops, some 15,000 troops completely demoralized, and a creation of a five-mile gap in the lines through which the Germans, had they been prepared to exploit the attack, could have driven a wedge that might have reached the English Channel and changed the entire course of World War I.

Chemical Warfare and the U. S. Army

When the United States entered the war two years later, the defensive and offensive aspects of gas warfare were the responsibility of five different agencies: the Bureau of Mines was in charge of research and development; the Medical Department handled the procurement and supply of gas masks and other defensive equipment, and was in charge of defensive training; the Signal Corps bought the gas alarms, and the Corps of Engineers was charged with offensive training and actual combat employment of gas. The need for a centralized service to conduct all of these activities resulted in the creation of the Chemical Warfare Service in mid-1918, as a temporary agency. However, the effectiveness of gas warfare in World War I led to the realization that there was a need for a fixed organization, and on July 1, 1920—now officially regarded as the Corps' birth date—the old Chemical Warfare Service became a permanent branch of the Army under the National Defense Act of June 4, 1920. In August, 1946, the name was changed to the present Chemical Corps.

Mission

At the time of its permanent formation, the mission of the Chemical Corps dealt only with the smoke, incendiary and gas aspects of chemical warfare. Through the years that have followed many changes have been made in the mission. Today, the broad general mission of the Chemical Corps is to study and investigate toxicological warfare. Biological warfare was added as a mission during World War II and radiological warfare shortly after the end of that war. In addition, the Corps must provide technical supervision of the military training in these fields, and develop, manufacture, procure and supply materiel and equipment pertaining to these types of warfare except where such actions are sepcifically assigned to some other agency.

Development

The Chemical Corps' position in the development field is unique in that most of its items are for use by all departments of the armed forces, the Army, the Navy, the Marine Corps and the Air Force. And, under the "all departments" terms, Civil Defense must be included, for it is in this type of planning that some of the Corps' defensive developments are being put to use.

While it is true that gas preparedness is a major responsibility of the Corps—and the carrying out of this responsibility undoubtedly deterred the Axis nations from initiating gas warfare in World War II for fear of retaliation far worse than their own efforts could ever be—it must be recognized that "chemical warfare" is an elastic term. Under its present-day aspect it stretches to include many scientific developments and applications that are little known to the general public, since "chemical warfare" usually suggests a single thought—war by poison gas.

The 4.2-inch mortar is only one of the many non-toxic contributions the Chemical Corps has given our fighting forces. Developed by the Chemical Corps in 1924 as a means of laying down toxic agent concentrations, the "4.2", firing high explosive shells, proved itself as an outstanding Infantry support weapon in World War II and Korea and now has been made an integral Infantry and Marine Corps weapon.

Between 1920 and 1940, the Corps expounded the virtues of aerial incendiary warfare. And in World War II the soundness of this type of warfare was proven. Today Communist forces in Korea are feeling the devastating heat of jettisonable airplane belly and wing tanks filled with napalm-jellied gasoline, as well as other incendiary type bombs. On the ground, Army Chemical Corps-developed napalm is being used in the fuel of portable and tank-mounted flame-throwers, the weapon for which it was originally developed.

Nor must the efforts of the Chemical Corps smoke generator units be overlooked. During World War II, smoke screens made either with mechanical generators, airplane spray tanks, 4.2-inch mortar shells, or burning smoke pots, played an extremely important part in denying enemy observation of our activities. Smoke screens lasting as long as 21 days were maintained by Chemical Corps troops in Europe, and in the

South Pacific smoke screens hid parachute drops of men and materiel. In Korea, on the front line, small and large smoke screens are made daily to hide supply routes, bridges, construction activities, and probing actions by the Infantry. Colored signal smokes, another Chemical Corps product, have played an important role in identifying targets, signaling for aid or for specific action to start.

These are some outstanding examples of the Corps' work which comes under the "elastic term" of chemical warfare. But no matter what extra job the Corps is doing that can hardly be classified as being in the toxic warfare field, its prime purpose is still to provide our nation a capability for defense and offense in case of toxicological warfare.

Toxicological Warfare and By-Products

Although practically the full capacity of the Chemical Corps is directed toward discovering, developing and supplying the protective equipment necessary to assure the immediate readiness of the free world to meet the dangers of toxicological warfare, all of this work does not lead merely to advancement in military needs. Often work on a military subject has developed an offshoot project which can provide a means of bettering the health and welfare of everyday civilian life. This has been especially true in the field of medicine.

The thought that a poisonous gas can be used as a medicine appears paradoxical. However, Chemical Corps scientists, working with medical researchers, have found that some war gases can be effectively used in treating certain forms of cancer. Experimentation has also led to a new antidote for arsenic and lead poisoning, the basis for this antidote being a compound perfected during World War II for use in combatting Lewisite gas poisonings. A nerve gas, long since discarded as impractical for war use, turned out to be beneficial in the treatment of glaucoma, an eye disease.

Contributions to Medical Science

The Corps, as a whole, has made a great many contributions which have been of benefit to mankind in one form or another. Medical laboratories at the Army Chemical Center have made numerous important contributions to medical science in the past few years. Some of these contributions have been:

Development, in conjunction with other technical agencies, of the following insecticides: HETP (hexaethyltetraphosphate), TEPP (tetraethylphrophosphate), and Parathion, as well as further development of DDT;

Participation in the development of Rodenticide 1080 (or sodium fluoroacetate), one of the most effective rat and wild rodent poisons now available;

Work, along with other agencies, which resulted in the conclusion that BAL (a substance used by the British for the treatment of persons gassed with Lewisite) and certain of its related compounds could be used to treat cases of poisoning occurring frequently in industrial plants;

The development of certain data pointing the way to possible control of epilepsy;

Much of the laboratory work and scientific data leading to the conclusion that the nitrogen mustards, previously considered as war gases, could be used to augment the more expensive peacetime drugs in the treatment of some types of cancer;

Considerable material and technical aid to a civilian project which discovered that a World War II nerve gas known as DFP (di-isopropyl fluorophosphate) could be used to alleviate the disease myasthenia gravis, which causes extreme weakness of the muscles.

Chemical Corps scientists found or aided in the work toward finding that DFP could also be used in cases of glaucoma, an affliction of the eye-ball caused by the pressure of internal liquids and often leading to blindness for successful relief of the urinary retention and distension of the bladder which often occurs after general anesthesia and in invalids during prolonged confinement to bed, and for elimination of the abdominal pain, nausea and vomiting experienced by abdominal surgery patients when the motility of the intestine is lost and the bowel distends with gas.

The Army Chemical Corps has also played a prominent role in developing:

A soil treating agent consisting of the war gas, Chlorpicrin, which improves the yield of small grains and sugar beets.

Development of a plastic grenade as a container for tear gas (often used in controlling riots), thus eliminating the dangerous fragmentation effects of the metal grenade.

The use of smoke generators to produce fog for the protection of crops against frost, and to put out dense clouds of insecticide smoke and weed killers.

Considerable data regarding the control of various crop diseases, an outgrowth of studies of possible defenses against an enemy attack with biological agents.

The use of shoe impregnite, originally designed as protection against blister gases, to keep out moisture and cold.

Development, in collaboration with the Canadian government, of a rapid method of producing large quantities of protective vaccine against rinderpest, or cattle plague.

A practical method for using PAPP (para-aminopropiophenone) as a remedy for cyanide poisoning.

Methods leading to the conversion of napalm into a liquid soap which can be used for general household purposes or in lavatory dispensers.

The portable flamethrower as a commercial device for killing weeds growing between plant rows and for burning off the thorny spines on cactus and other desert plants so as to render them suitable as feed for cattle.

A safe method for fumigation of ships.

The 400-gallon, truck-mounted gas decontamination set for use in spraying insecticides on cattle, crops, and breeding places of the malarial mosquito.

Pyrogel or "goop" (an incendiary bomb filling) for the prevention of forest fires.

Herbicides which can be sprayed over crops or mixed with the soil to kill broad leafed plants but not affect most grasses.

Data on the correlation between chemical structure and activity of insect repellants and attractants.

From the Chemical Corps studies in the biological warfare field have also come some valuable contributions to medical science and the national economy, such as advances in the treatment of several infectious diseases, studies of immunity development in humans and animals, increased knowledge of use and effect of antibiotics, production and isolation of pure bacterial toxins and their use in preparation of toxoids, development for rapid means of detection of minute quantities of disease-producing agents, developments of methods in production and use of toxoids and vaccines, improvements in methods of production of micro-organisms and their products, information on production and control of plant diseases, development of protective devices and techniques for safe handling of pathogenic micro-organisms and their toxic products.

The Army Chemical Corps has, in its 33 years of existence, quietly and efficiently forged a strong link in the national defense chain and at the same time made important steps toward bettering the health and welfare of mankind.

THE INCENDIARY BOMB

An account of the development and use of incendiary bombs in World War II including examples of the effects of mass attack with these weapons and explanation of the "Fire Storm."

by BROOKS E. KLEBER Historical Office, OC Cml O, Army Chemical Center, Md.

In the mid-1930's, when many were thinking of the use of aerial high explosive and gas bombs, a CWS reserve officer warned of the terrible destructiveness of aerial incendiaries. Colonel J. Enrique Zanetti, Professor of Chemistry, Columbia University, stated in one article: "Each of these small bombs (holds) within itself the devasting possibilities of Mrs. O'Leary's Cow." It was less than ten years later that an all-incendiary raid by the 21st Bomber Command destroyed 158 square miles of the city of Tokyo and caused the death of 83,000 people.

Although incendiaries are as old as war itself, the aerial incendiary bomb, dependent as it is upon aircraft, was used first during World War I. The Germans dropped incendiaries on England from both airplanes and zeppelins. This early munition, consisting of a core of thermit wrapped with tarred cotton waste and tarred rope, was a crude affair. Just before the end of the war Germany devised the one-kilo electron bomb, consisting of a magnesium-thermit filler in a magnesium alloy casing. Although this bomb was not employed in the first World War, it served as the prototype for a very effective group of World War II aerial incendiaries.

The Allies developed several incendiary bombs during World War I although none was used extensively. The British had a "baby incendiary" and the French produced a bomb called the *Chenard*. Two types of incendiary darts were developed in the United States but neither reached the production stage. Therefore, the US air units used the French *Chenard*, reputedly the most efficient of the Allied bombs.

Little Interest Initially

Little interest was shown in the United States in an incendiary bomb program even after Colonel Zanetti issued his warning. Although a project to find incendiary fillings for bombs was established in 1937, on the eve of our entry into World War II the United States had but one standardized aerial incendiary, the 100-lb M47 gasoline bomb. This situation existed largely because of the continuing belief in the superiority of high explosives. In mid-1941, with Europe already embroiled in war and with the United States standing on its threshold, incendiary bombs were but a cipher in the armament of the American Forces. At that time there were several aerial incendiaries in fairly wide usage in Europe. Germany had its electron bomb and a 110-kilo oil bomb; Great Britain possessed a 4-pound magnesium bomb very similar to the German electron.

Primarily as a result of the extremely effective use the Germans were making of incendiaries in their air war against Great Britain, the War Department in 1941 took an increased interest in aerial incendiaries. Having little in their own experience to fall back upon, the CWS for a start turned to European models. In the summer of 1941 the Chief, CWS, recalled Colonel Zanetti to active duty and sent him to England to obtain information on the design and manufacture of the British 4-pound incendiary.

At first an outmoded division of responsibility confronted the efficient development of this important munition. From 1920 the Ordnance Department handled the procurement, storage and issue of incendiary bombs while the CWS developed incendiary material and filled the munition. This situation was eliminated in September 1941 when the CWS was given the responsibility for the entire incendiary bomb program.

Four American aerial incendiaries—the M50, the M69, the M47, and the M76—were used extensively in the second World War. The M50, based on the British model which Colonel Zanetti investigated in 1941, consisted of a core of thermate and a casing of magnesium alloy. The outstanding features of this four-pound bomb were a high degree of penetrability and an intensive burning action. The Eighth Air Force held the M50 in high regard for it was particularly appropriate for use against German targets.

B17's of the Eighth Air Force drop M47's somewhere in Europe.

Different Target Requirements

Here it may be well to describe the nature of strategic bombing targets. Most of them were area targets, such as cities and industrial groups. Incendiary bombs are especially effective against area targets for if the construction within the area is inflammable, it is possible for the fires to feed on the surrounding structures. Area targets are divided into fire divisions, those sections which can be readily consumed by an unchecked fire. They are limited by fire barriers which take the form either of waterways, avenues, and railroad tracks or of fire walls, built intentionally as in the case of modern structures, or mere-

ly the result of the type of architecture or building material of a locality.

In Germany 95 percent of the construction consisted of brick and stone. Buildings were usually furnished with fire walls so that individual rooms as well as adjacent structures were protected from one another. Since effective incendiary results depend upon the breaking into a large number of fire divisions or compartments, the small size, high penetrability and intensive burning action of the M50 made it ideal for most German domestic and commercial buildings, as well as those factories and warehouses without re-enforced roofs.

But the M50 incendiary bomb was not effective against the typical domestic dwellings of Japan, wherein an essential portion of Japanese production took place. The very qualities which made it a popular munition in the air war against Germany negated its usefulness against Japan. Eighty percent of Japanese buildings were made of paper and wood. Thus, the M50 could penetrate these flimsy structures and bury itself harmlessly in the ground. The small incendiary munition which fulfilled the requirement for the attacks in Japanese urban areas was the M69 incendiary bomb.

U. S. Develops the Oil Bomb

Although the prototypes for most of the American aerial incendiaries could be found in Europe, the M69, was strictly an American development. Its design was suggested early in the war when magnesium was scarce and substitutes for that incendiary material were in demand. Researchers turned to oil, a commodity of which the United States had an abundance, and with the development of an effective gel the success of the M69 was insured.

This six-pound bomb, stablized in flight by cloth streamers, functions like a small mortar when it comes to rest. A fuze, activated by impact, ignites an ejection charge which expels the burning gel through the tail of the bomb. Its low penetrability made it ideal for use against Japanese construction, and in all nearly 8½ million M69's were dropped upon targets in that nation. In the opinion of the Joint Target Group of the Army Air Forces this bomb produced unparalleled destruction in many Japanese cities. No bomb ever used before had caused such vast and complete destruction as was produced by the M69 on the 10 March 1945 raid on Tokyo.

The small bombs, of which the M50 and M69 were the most popular, were clustered together to insure efficiency in loading and releasing. There were two types of cluster adapters, the quick-opening and the aimable. The former proved undesirable because of the lack of accuracy with which the bombs could be dropped and because of the danger that these quickly released missiles would strike other aircraft in the formation. The aimable cluster, distinguished by a delay fuze which broke open the adapter at any desired altitude, largely solved these two problems.

The 100-lb M47 incendiary bomb (it actually weighed only sixty-nine pounds) was America's only standardized aerial incendiary in 1941. This light-cased bomb at first was filled with unthickened gasoline or oil but later contained the more effective incendiary gels. The M47 held forty pounds of incendiary filling and was known for its high degree of aimability and penetrability. It was used effectively both on bombing raids over Germany and Japan. The pathfinder forces of the 21st Bomber Command held M47's in high regard because they served as aiming points for succeeding aircraft, as well as starting large fires. The bombs were used even more efficiently when toggling devices were developed which grouped four to six M47's at one bomb station.

500-lb Bomb the Largest

The 500-lb M76 was the largest aerial incendiary developed by the CWS in World War II. Like the M47, but on a grander scale, it had a high degree of aimability, penetrability and fire-raising potential. A substantial number of these bombs were used by the RAF for special missions against important pinpoint targets. On one occasion the RAF, on a mission against a building in the Hague containing the Nazi records of Dutch resistance forces, completely destroy their target leaving buildings across the street undamaged.

These, then, were the most effective American incendiary bombs. Yet, as the discussion of the type of targets in Germany and Japan has suggested, there was more scientific study behind an incendiary mission than that which pertained to the bombs themselves. The British, because they had entered World War II at any early date and as a result of the German air war against their cities, took an early lead in the study of scientific incendiarism. They established an operational research organization where scientists, statisticians, and photo interpreters studied target areas, compared the effects of incendiary and high explosive munitions, and evaluated the different incendiary bombs. Their findings were available to both the British and American air forces. Later, operational research sections were established within U.S. Army Air Forces.

Air Forces commanders did not immediately accept the aerial incendiary. Every new weapon experiences difficulty in gaining the acceptance of the using arm, and as the high explosive bomb was the type with which the Air Corps was familiar, it is understandable that it would not embrace an untried weapon without reason. Moreover, the early bombs produced by the CWS were far

This photo taken over Kiel shows two 500-pound quick opening clusters. One has broken scattering its M50 bombs; the other is about to burst.

Soldiers of a Chemical Company, Air Operations, with the Eighth Air Force load a bomb bay with M-7 500-pound cluster of M50 bombs.

B29's drop M47's on Kobe, Japan, 5 June 1945.

During World War II the large majority of incendiary bombs were dropped by heavy bombers on targets deep in the enemy's homeland. Tactical air units, it is true, sometimes employed M50's, M47's, and M76's, but their most effective incendiary munition was the fire bomb. For the story of the fire bombs tremendous success in Korea see Lt. Earle J. Townsend's article "Hell Bombs Away," in ARMED FORCES CHEMICAL JOURNAL, Vol. IV, No. 3, January 1951.

Ground crewman on Saipan hands a 500-pound aimable cluster of M69's to a B29 bomb bay.

from perfect. Colonel C. M. Kellogg, Chemical Officer of the Eighth Air Force, did much to convince his organization of the desirability of using incendiary bombs. Gradually, throughout the European war, experience proved that aerial incendiaries had a very definite part in the strategic bombing of Germany.

Raids on Hamburg

During World War II Hamburg, of all German cities, probably suffered the most from incendiary bombing. All told that German city was bombed 213 times during World War II but the seven raids between 24 July and 3 August 1943 carried out by the RAF with some assistance from the Eighth Air Force, proved to be its most punishing ordeal. In the four heaviest raids Hamburg was attacked by 600, 800, 1,000 and 300 planes. The very large majority of the 1½ million bombs dropped were of the 4-pound incendiary variety.

These few summer days were known as the catastrophic period. Hamburg officials estimated that 45,000 people were killed. Yet this number was perhaps incorrect, for as one German document explained: "Exact figures could not be obtained out of a layer of human ashes." Approximately one million people fled from the city, and three-tenths of the houses were destroyed.

Perhaps we can gain a more graphic picture of the extent of destruction if we consider that Boston and its metropolitan area roughly compares in size to the city of Hamburg. Then imagine that every building within the limits of Boston proper had been destroyed. Hamburg looked about like that in August 1943.

How Fire Storms Develop

The worst raid took place on the night of 27-28 July, for it was at this time that a fire storm developed. In the lexicon of scientific incendiarism there are various degrees of fires. The less serious can be controlled by amateur firefighters using portable equipment; an appliance fire can only be controlled by professionals and their equipment; and a conflagration, the goal of an incendiary attack, is beyond the cope of all fire-fighting units. But the fire storm is a seldom achieved result of an incendiary attack. This phenomenon is born of a great mass of fire combined with little or no surface winds. A huge pillar of heated air and gasses rise vertically over the inferno, and cold air rushes in from all sides of the base of the pillar to replace that which is rapidly rising. The velocity of these surface winds can uproot trees up to three feet in diameter and tear the clothes from a person's back. Additional casualties are caused from asphyxiation, and the inhalation of intense heat.

According to one official German report on the catastrophe the large amount of Hamburg's casualties and damage was the result of fire storms. The alternate dropping of blockbusters (and other high explosives) and incendiaries made fire fighting impossible. Hence, small fires formed conflagrations and conflagrations turned into fire storms. The terrorized people refused to leave shelters for an uncertain flight through the flames. Instead they waited until the intense heat forced them to leave. Then often it was too late, for many were asphyxiated by carbon monoxide or the routes of escape were barred by debris. The report graphically pictured the conditions: "No phantasy will ever be able to describe the scenes of terror and horror which took place in the shelter or in the bunkers; or the following days when terrific heat combined with the fire tempest made life unsupportable, when fine penetrating dust, rains of ashes and cinders darkened the sky and the pestilential smell of decaying bodies filled the streets."

The following exerpt was taken from the files of Hamburg's Office of the Chief of the Fire Brigade. It is part of a report of one man's experience on that awful night.

> I tried to get out of the crater, but heat and flying sparks made it impossible . . . Then I made use of the water on the bottom of the crater in order to keep me wet. The heat and the rain of sparks became intolerable. Ever again debris of the collapsing houses dropped into the crater . . . Suddenly I heard a groaning and discovered a boy, who had crept into the broken watermain in order to protect himself against the fire. He was halfway covered with mud. I excavated him with my steel helmet. Several more persons came to the crater or dropped into it, some fell on the pieces of pipes and smashed (their) heads, some were drowned in the water. From time to time I glanced at the street and perceived a lot of corpses lying there. I saw the clothing of the persons was suddenly on fire, they dropped and lay on the ground. The air was awfully hot now. I had a feeling as if to suffocate, lips, mouth and bronchial ways were entirely dried out. I was quite absent-minded and breathing was exceeding difficult. Thus I remained at least an hour in the crater. When the heat lessened I went out and marched in the direction of our storage place. Many were lying in the streets, some of them totally burnt, some with their clothing burnt, others even naked.

Such was the potentiality of aerial attacks with incendiary bombs. It can be seen from this Hamburg account that incendiary and high explosive bombs complemented each other to produce devastation in a bombed city. In American missions against Germany, the IB-HE ratio was slowly changed to allow for the use of high percentages of aerial incendiaries.

Operations in the Pacific

In the Pacific, the full potentiality of the incendiary bomb was not achieved until 1945. The enemy targets on the road to Japan were not especially vulnerable to incendiary attack. Morever, once bases were acquired to enable B-29's to bomb cities of the homeland, the tactics used were not the most effective. New techniques were employed in March 1945, and the series of "blitz" raids which resulted contributed greatly to Japan's decision to capitulate.

Let us look at the tactics used by the Twentieth Air Force before the era of the "fire blitz." Planes, carrying a large percentage of high explosive bombs, flew high altitude, daylight missions against the cities of Japan. On 14 January 1945, for example, B-29's dropped ninety-four tons of HE on the Mitsubishi aircraft plant in Nagoya and achieved only fair

results. This target was attacked seven more times within a period of several months, certainly an indication of the comparative ineffectiveness of these raids.

These tactics had proven successful against Germany, but this fact alone was no insurance for an equal success against Japan. We have seen that the industrial areas of the two countries greatly differed. In contrast with Germany, the large percentage of Japanese construction was easily combustible. Japanese cities had frequently experienced peace-time conflagrations; German cities had not. Then too, area incendiary attacks against Japanese cities would disrupt their extensive "household" industries, upon whose products the larger plants depended. One Air Force writer described the situation in this way, "We had developed a pickle-barrel philosophy that became identified with strategic bombing itself." In other words, high level, pin-point bombing was not necessarily the best answer for attacks against Japan.

The descriptions of the horror Hamburg and Tokyo suffered from incendiary raids make unpleasant reading. These scenes have been included to complement the technical discussion of incendiaries and to reveal the awful aspects of war to those of us to whom such scenes are alien.—Author.

New Tactics Introduced

Major General Curtis E. LeMay, Commanding General of the 21st Bomber Command, saw that radical changes were needed. His planes were to make individual runs on the target, under the cover of darkness, at altitudes of from 6,000 to 7,000 feet. Formerly, they had attacked in formation and during daylight at heights of from 20,00 to 30,000 feet. Only incendiaries were to be used, and all armament was stripped to make room for more bombs. Most of these changes meant that more incendiaries could be carried in an effort to completely overwhelm the fire defenses. A night attack was not only expected to achieve surprise but to take advantage of the comparative ineffectiveness of Japan's night fighter planes and radar gun-laying devices.

These new tactics were first used against Tokyo on the night of 9-10 March 1945. The B-29's carried 1,667 tons of incendiaries (1,539 tons of M69's and 128 tons of M47's). The pathfinder elements carried the M47's which, as had been mentioned before, served as aiming points and started appliance fires. Then the M69's started a multitude of small fires which joined to produce large ones. Within thirty minutes conflagrations had been formed which soon made all efforts to combat the flames fruitless. Firemen sped to one burning area, worked until the blaze got out of control, and then tried elsewhere. Large quantities of fire-fighting equipment were destroyed and casualties to auxiliary police and fire units surpassed 500.

A United States Strategic Bombing Survey report described the scene:

> People running for refuge were trapped by the bombings ahead and around them and were encircled with flame and black smoke. They looked for protection to the canals and rivers but in some districts the shallow canals were boiling from the heat which seemed to be compressed with the wind, and the canals were full of people. In some places one swarm of humanity after another crowded into the water and by the time a third or fourth wave of frantic people had jumped, the first wave lay at the bottom.

On this night 83,793 people died, 41,000 were injured, and more than one million were made homeless. Almost sixteen square miles of the center of Tokyo were destroyed or seriously damaged. Standing amidst this desolation were the sagging structures of modern, fire resistant buildings. So hot

(Continued on page 58)

WINNERS OF AFCA AWARDS TO OUTSTANDING ROTC STUDENTS

Pictures below are those of outstanding Air Force ROTC students who were among those who won AFCA awards this year. These photographs were not available to publish in the July issue of the JOURNAL along with those of other award winners.

RICHARD BALZHISER
AFROTC
University of Michigan
Ann Arbor, Michigan

EMMETT K. BURK
AFROTC
University of Missouri
Columbia, Missouri

JOHN F. GARST
AFROTC
Mississippi State College
State College, Mississippi

DONALD T. KJERLAND
AFROTC
Iowa State College
Ames, Iowa

ALLEN S. MASON
AFROTC
Kansas State College
Manhattan, Kansas

★

GERALD W. SCHWEITZER
AFROTC
Duquesne University
Pittsburgh, Pennsylvania

RICHARD G. SNYDER
AFROTC
Rutgers University
New Brunswick, New Jersey

ANTHONY TURANO, JR
AFROTC
Massachusetts Institute of Technology, receiving the award.

★

DOW

NEW TECHNICAL LIBRARY AT DOW BASIC TO PROGRESS IN RESEARCH

These modern facilities provide current information on all fields of research, as well as opportunity for further education

The desire to provide complete technical knowledge for Dow personnel, together with careful and intelligent planning, has produced one of the most comprehensive, most modern of all industrial libraries at Midland, Michigan.

Modern in design, this four-level structure contains more than 35,000 books and over 600 magazines and newspapers in six languages. New books are added frequently, and both foreign and domestic abstracts are constantly made available.

Most of the material is of a highly technical nature. The most extensive coverage is given to material closely related to the fields of chemistry, electrochemistry, biochemistry, nuclear physics, and tracer chemistry.

Ten people are required to maintain this vast fund of information. A book catalog, periodical index and microfilm index are kept up to date by the staff, in addition to a central research index of written reports on all work conducted at Dow. The Dow Patent Department also has files of its own and other chemical patents in the building.

Extremely able personnel continually being supplied with the latest facilities like these has been the major factor in Dow's rise to world prominence in the chemical industry. THE DOW CHEMICAL COMPANY, Midland, Michigan.

you can depend on DOW CHEMICALS DOW

CHEMICAL CORPS UNITS

CITED FOR KOREAN SERVICE

2ND CHEMICAL MORTAR BATTALION

21ST CHEMICAL DECONTAMINATION COMPANY

51ST CHEMICAL TECHNICAL INTELLIGENCE DETACHMENT

388TH CHEMICAL SMOKE GENERATOR COMPANY.

401ST AND 503RD CHEMICAL TECHNICAL SERVICE INTELLIGENCE DETACHMENTS

Five new citations of Chemical Corps units for outstanding performance of duty in Korea are carried in two recent General Orders issued by the Department of the Army.

These citations which name six different organizations all pertain to operations at various periods during the year preceeding the signing of the truce.

They reflect to a considerable extent the diversity of the Chemical Corps role in the field and the importance of its contribution to the Korean operations.

Especially noteworthy is the award of "Distinguished Unit Citation" to the 2nd Chemical Mortar Battalion. This high honor was extended in a ceremony in which the renowned General Van Fleet attached the citation streamer to the battalion colors to take its place along with others which mark the long battle record of the organization. It was a final honor to the "Second Chemical" which, pursuant to transfer of jurisdiction of the 4.2" mortar to the Infantry, was redesignated the 461st Infantry Battalion (Heavy Mortar). The battalion at the time of the service for which it was cited was commanded by Lt. Col. John Lee Carson, since returned to the United States. The citation quoted from G.O. No. 46, Department of the Army, 26 May 1953, reads:

"The 2d Chemical Mortar Battalion distinguished itself by outstanding performance of duty and extraordinary heroism in action against an armed enemy in the vicinity of Kumhwa, Korea. During the period 7 to 22 October 1952, when the Communist forces massed their strength and launched a concerted attack against a vitally important portion of the United Nations line, this battalion functioned in support of units of the Republic of Korea Army which bore the brunt of the assault. Exhibiting a high degree of mobility and self-sufficiency which fitted them admirably for their exacting and hazardous task, the members of this battalion moved along the entire width of the battle line, emplacing where the fighting was heaviest, inflicting tremendous casualties among the attackers, and redeploying as soon as a relative lull occurred to another sector where the savage battle flared anew. With a singleness of purpose and self-imposed discipline which drove them relentlessly, these men went without sleep for days at a time, fully aware of the critical importance of their fire to the gallant Republic of Korea troops fighting against heavy odds to protect their homeland. With each round fired by the battalion's mortars, the enemy instantly moved to locate the position held by the friendly troops and directed counterbattery against it. Heavy casualties were suffered by the men of the battalion as a result of the foe's constant efforts to destroy them, but even under the most intense fire they would not quit their positions until their fire mission was completed. Forward observer teams were repeatedly sent to exposed posts to relay information to the batteries. These too were singled out by the enemy for annihilation as soon as their presence was known, but they continued, with selfless devotion to duty, to uncover concentrations of the enemy and stop innumerable attacks before they could gather momentum and threaten temporarily weakened friendly positions. As a result of the ceaseless and heroic efforts of the personnel of the 2d Chemical Mortar Battalion, mortar fire alone held back waves of the attackers as the defenders worked desperately to close gaps in their lines caused by the frenzied assaults of the foe. With a display of fortitude and steadfastness which long will be remembered by all those who witnessed it, the 2d Chemical Mortar Battalion played a role of incalculable value throughout this critical period of hostilities when the enemy, without regard for losses, smashed again and again at the friendly defenses in an effort to break through and, through sheer weight of numbers, destroy the fighting potential of the forces of freedom battling in Korea. The magnificent fighting spirit, esprit de corps, and unshakable, inspiring confidence exhibited by the personnel of this battalion were responsible in great measure

for the smashing defeat of the hostile forces, thus reflecting utmost credit on themselves and upholding the most esteemed traditions of the military service. (General Orders 189, Headquarters, Eighth United States Army, Korea, 4 February 1953.)"

The same Department G. O. carries the following "Meritorious Unit Commendation" of the 21st Decontamination Company. Here again one of these units, as was so often demonstrated in World War II, has shown adaptability for useful work other than the gas-protection duties for which such units were designed and especially trained. The citation reads:

"The 21st Chemical Decontamination Company (second a ward) is cited for exceptionally meritorious conduct in the performance of outstanding services in support of combat operations in Korea during the period 1 July to 31 December 1952. Through diligent and conscientious application to duty, the members of this company maintained a superior record of achievement. The company supplied vast quantities of napalm to several organizations, provided shower facilities for thousands of United Nations personnel, conducted technical training, and supervised tests of experimental equipment. The standard of performance remained constantly superior despite rapid turn-over in personnel and widespread operation. The 21st Chemical Decontamination Company displayed such outstanding devotion to duty in the performance of unusually difficult tasks as to set it apart from and above other units with similar missions. The determination, loyalty, and esprit de corps exhibited by the members of this company reflect great credit on themselves and the military service of the United States. (General Orders 432, Headquarters, Eighth United States Army, Korea, 27 April 1953.)"

A later general order, No. 55, Department of the Army, 30 June 1953 carries three additional Meritorious Unit Commendations pertaining to Chemical Corps units, as follows:

"The 51st Chemical Technical Intelligence Detachment is cited for exceptionally meritorious conduct in the performance of outstanding services in support of combat operations in Korea during the period 15 October 1950 to 14 February 1952. As the first chemical technical intelligence unit in Korea, the detachment successfully developed new procedures to accomplish its mission of collecting, evaluating, and reporting vital chemical, biological, and radiological intelligence information. The procedures established and developed by the detachment have become the basis for operations adopted by succeeding chemical technical intelligence units. Because it operated throughout the entire Eighth Army area, an area three times larger than normal for a unit of its size, and endured the severe hardships encountered during the first two winters of the Korean action, the detachment earned a superior record of accomplishments. The 51st Chemical Technical Intelligence Detachment displayed such outstanding devotion to duty in the performance of unusually difficult tasks as to set it apart from and above other units with similar missions. The loyalty, determination, and esprit de corps exhibited by the members of this detachment reflect great credit on themselves and the military service of the United States. (General Orders 512, Headquarters, Eighth United States Army, Korea, 26 May 1953.)"

"The 388th Chemical Smoke Generator Company (augmented) is cited for exceptionally meritorious conduct in the performance of outstanding services in support of combat operations in Korea during the period 1 September 1952 to 30 April 1953. Through diligent and conscientious application to duty, the members of this company maintained a superior record of achievement. The company provided uninterrupted smoke support to the forward elements of three United States corps. The standard of performance remained constantly superior despite rapid turnover in personnel and widespread operation. The 388th Chemical Smoke Generator Company displayed such outstanding devotion to duty in the performance of unusually difficult tasks as to set it apart from and above other units with similar missions. The determination, loyalty, and esprit de corps exhibited by the members of this company reflect great credit on themselves and the military service of the United States. (General Orders 500, Headquarters, Eighth United States Army, Korea, 22 May 1953.)"

"The 401st Chemical Technical Service Intelligence Detachment (second award), with the 503d Chemical Technical Intelligence Detachment attached, is cited for exceptionally meritorious conduct in the performance of outstanding service in support of combat operations in Korea during the period 1 October 1952 to 29 May 1953. The detachment, the only organization of its kind in Korea, collected vital intelligence information pertaining to chemical, biological, and radiological warfare through interrogation of prisoners of war and research on captured enemy materiel and documents. By skilled evaluation and interpretation of technical evidence, the detachment was successful in obtaining and disseminating valuable information and statistics concerning enemy training, equipment, and capabilities pertaining to chemical, biological, and radiological warfare. Although operating over an area much larger than that expected of a unit its size, the detachment assisted in training United Nations personnel in chemical, biological, and radiological defense while carrying out its normal duties in a superior manner. Despite a rapid turnover in personnel, the detachment consistently maintained an efficient and smooth-functioning program and exhibited a genuine willingness to assume additional responsibilities. The 401st Chemical Technical Service Intelligence Detachment with the 503d Chemical Technical Intelligence Detachment, attached, displayed such outstanding devotion to duty in the performance of unusually difficult tasks as to set it apart from and above other units. The loyalty, aggressiveness, and esprit de corps exhibited by the members of this detachment reflect great credit on themselves and the military service of the United States. (General Orders 524, Headquarters, Eighth United States Army, Korea, 29 May 1953.)"

General Van Fleet (now retired) accompanied by Lieut. Gen. Maxwell Taylor who replaced him as Commander of the Eighth Army in Korea, is shown attaching the Distinguished Unit Citation streamer to the colors of the 2nd Chemical Mortar Battalion which was since redesignated the 461st Infantry Battalion (Heavy Mortar).

COMBAT SMOKE IN KOREA

(Continued from page 23)

Adding to the generator maintenance problems, and equally important, was vehicle maintenance. In the spread-out situation, and with the excessive transporting of generators for repairs, the company was at times barely able to keep operating with the worn-out World War II jeeps and trucks. The issue of the new family of vehicles in Eighth Army has drastically improved this situation.

The third all-important factor in operating a smoke company—the first two being generator and vehicles—is personnel, and this has been a plaguing problem always in Korea. The rotation system has caused a constant turn-over of personnel, and shortages in the appropriate MOS (Military Occupational Specialty) have necessitated on-the-job training under combat conditions. Replacement generator operators are trained at company headquarters for about a week, where operation and first echelon maintenance of the equipment is covered. Men are then assigned to platoons, where they are first placed on duty at a generator position with an experienced man. Later they are given charge of a position of their own.

More recently, particularly during periods of personnel shortages, KATUSAS have been furnished to the smoke companies. These are Korean Army Troops attached to U. S. Army units, usually in excess of T/O&E (Table of Organization and Equipment) spots. The units have been successful in training these men as generator operators and mechanics, and in a variety of supply and service jobs.

Operation of smoke generator units in close support of combat, in continuous static positions, has shown that care must be exercised not to over-commit a company. Instead of planning in terms of a maximum company effort of say 36 to 48 generators for a brief all-out mission, plans must be made for sustaining for extended periods the largest possible number of positions, which may be far less than the number of generators available. Committment of an element must provide for a reserve which will enable rotation of men from front-line to "battalion area" for proper maintenance of equipment, necessary standards of personal hygiene, training and normal rests. It has been found that a squad in exposed positions can operate only two positions *continuously*, since two men are required on each position for security. Of the six squads of a full-strength platoon, two should be kept for rotation purposes. Thus a platoon can operate eight positions continuously, but with two generators per position if desired. Committments beyond this point will collapse in a short time from exhaustion of the men.

In less exposed positions, or where distances between positions are not great, security can be consolidated and accomplished with less than two men per position, and at some distances behind the MLR one man per position is again adequate. Flexibility in planning operations on an individual basis will allow for the maximum utilization of men and equipment.

With this concentrated effort on the part of such a small number of men, what then have been the results? First, and most important, they have made a very large volume of smoke.

(Continued on page 59)

TOP: Ground view of important bridge under construction exposed to hostile observation. TOP, CENTER: Air view of initial screen with smoke pots and generators to screen the bridge construction operations. BOTTOM, CENTER: Air view showing full smoke coverage of the bridge and surrounding area by smoke generators. BOTTOM: Ground view showing bridge construction operations protected by smoke.

How WITCO is Meeting Vital Chemical Defense Needs

Witco's 8 plants, geared for efficient production . . .

Brooklyn, N. Y.	Stearates, Stabilizers
Chicago, Ill.	Napalm, Esters, Driers, Asphalt, Mastics, Organic Chemicals, Stearates, Plasticizers, Stabilizers, etc.
Westlake, La.	Oil Blacks
Lawrenceville, Ill.	Asphalt
Perth Amboy, N. J.	Asphalt
Sunray, Texas	Carbon Blacks
Witco, N. M.	Carbon Blacks
Witco, Texas	Carbon Blacks, Hydrocarbons

Witco's research laboratories geared for development problems

Witco's laboratories in Brooklyn, Chicago, and Amarillo, Texas, have produced many new products and are constantly striving to improve the quality of standard products, to provide better chemical materials for the defense effort.

Witco's technical service staff lends expert assistance with the applications and formulations involving all Witco products.

These Witco facilities are serving the vital needs of defense in production and in research. Your inquiries will receive prompt attention.

A few of Witco's products meeting government specifications . . .

Aluminum Stearate (MIL-A-1526, A-Ships)
Barium Stearate (JAN-B-366)
Calcium Resinate (MIL-C-20470 Type I and Type II)
Calcium Stearate (explosives) (JAN-C-263)
Carbon Black, Dry (explosives) (JAN-C-306 Amend. 1)
Case Liner Adhesive (MIL-A-140A Type I and Type II)
Composition, Top-coating Material, Bituminous (JAN-P-102)
Compound, Chassis Coating (AXS-1827 Amend. 1)
Compound, Rust Preventive, Thin Film (AXS-673)
Copper Naphthenate (for many mildewproofing specifications)
Dibutyl Phthalate (explosives) (JAN-D-218); (plasticizer) (TT-D-301 Amend. 1)
Drier, Paint, Liquid (TT-D-651a Amend. 1, Type I and Type II)
Driers, Naphthenate, Liquid, Concentrated (TT-D-643a Type I, Lead 24%; Type II, Cobalt, 6%; Type III, Manganese 6%; Type IV, Zinc 8%)
Lead Stearate (ammunition) (JAN-L-758)
Linoleate, Lead (MIL-L-17190 Ships)
Linoleate, Manganese (MIL-M-15188A)
Lithium Hydroxystearate and Lithium Stearate (aircraft and instrument grease) (MIL-G-3278); (automotive and artillery grease) (MIL-G-10924)
Magnesium Stearate (ammunition) (JAN-M-542 Amend. 1); (ointment) (JAN-M-560)
Napalm Thickener (JAN-N-589 M-1 and M-2)
Paint, Acid-Proof, Black (ammunition) (JAN-P-450 Amend. 1 Type I and Type II)
Sodium Resinate (rosin soap) (MIL-S-6138A)
Wood Preservative, Copper Naphthenate (MIL-P-906A Ships)

Also Asphalt and Asphalt Compounds meeting Military and Federal Specifications

WITCO CHEMICAL COMPANY
DEFENSE PRODUCTS DIVISION
260 Madison Avenue, New York 16, N. Y.

GROUP AND SUSTAINING MEMBERS

OF THE ARMED FORCES CHEMICAL ASSOCIATION

Abbott Laboratories, North Chicago, Ill.
Aerial Products, Inc., Elkton, Md.
Affiliated Gas Equipment, Inc., Cleveland, Ohio
Air Reduction Company, Inc., New York, N. Y.
Allen Products Corp, Nashville, Tenn.
Allied Chemical & Dye Corporation, New York, N. Y.
American Aniline Products, Inc., New York, N. Y.
American Cyanamid Company, New York, N. Y.
American Stove Company, St. Louis, Mo.
American Zinc, Lead & Smelting Company, St. Louis, Mo.
Ampco Metal, Inc., Milwaukee, Wisc.
Armour & Company, Chicago, Ill.
Armstrong Cork Company, Lancaster, Pa.
Atlas Powder Company, Wilmington, Del.
Baker & Company, Inc., Newark, N. J.
Bastian-Blessing Company, The, Chicago, Ill.
Bechtel Corporation, San Francisco, Calif.
Blaw-Knox Construction Company, Pittsburgh, Pa.
Blickman, S., Inc., Weehawken, N. J.
Bridgeport Brass Company, Bridgeport, Conn.
Brown Company, Berlin, N. H.
Buffalo Electro-Chemical Company, Inc., Buffalo, N. Y.
Canfield, H. O., Company, The, Bridgeport, Conn.
Casco Products Company, Bridgeport, Conn.
Celanese Corporation of America, New York, N. Y.
Central Foundry Company, The, Newark, N. J.
Chamberlain Corporation, Waterloo, Iowa
Chicago Electric Manufacturing Co., Chicago, Ill.
City Chemical Corp., New York, N. Y.
Columbia-Southern Chemical Corp., Pittsburgh, Penna.
Continental Can Co., Inc., Chicago, Ill.
Continental Oil Co., Ponca City, Okla.
Crown Can Company, Philadelphia, Pa.
Curtis Industries, Inc., Helene, Chicago, Ill.
Diamond Alkali Company, Cleveland, Ohio
Dow Chemical Company, Midland, Mich.
Dunham, C. A., Co., Chicago, Ill.
E. I. duPont de Nemours & Co., Inc., Wilmington, Del.
Empire Stove Company, Belleville, Ill.
Ethyl Corporation, New York, N. Y.
Evans Research & Development Corp., New York, N. Y.
Federal Cartridge, Minneapolis, Minn.
Federal Laboratories, Inc., Pittsburgh, Pa.
Ferguson, H. K., Company, The, Cleveland, Ohio
Ferro Corporation, Cleveland, Ohio
Firestone Industrial Products Div., Fall River, Mass.
Fisher Price Toys, Inc., East Aurora, N. Y.
Fisher Scientific Co., New York, N. Y.
Fluor Corp., Ltd., The, Los Angeles, Calif.
Foster Wheeler Corporation, New York, N. Y.
Fram Corporation, Providence, R. I.
Fraser & Johnston, San Francisco, Calif.
Gasket, Packing & Specialty Co., Inc., New York, N. Y.
General Aniline & Film Corporation, New York, N. Y.
General Tire & Rubber Company, The, Wabash, Ind.
Glyco Products Company, Inc., Brooklyn, N. Y.
Goodrich, B. F., Chemical Company, Cleveland, Ohio
Goodyear Tire & Rubber Company, Akron, Ohio
Gray Stamping & Manufacturing Co., Plano, Ill.
Greer Hydraulics, Inc., Brooklyn, N. Y.
Gulf Oil Corporation, Pittsburgh, Pa.
Haertel, Walter, Company, Minneapolis, Minn.
Handy & Harman, New York, N. Y.
Harshaw Chemical Company, The, Cleveland, Ohio
Harvey Machine Co., Inc., Torrance, Calif.
Hercules Powder Company, Wilmington, Del.
Heyden Chemical Corporation, New York, N. Y.
Hooker Electrochemical Company, Niagara Falls, N. Y.
Howell Company, The, St. Charles, Ill.
Hyman, Julius & Company Div., Denver, Colo.
Industrial Rubber Goods Company, St. Joseph, Mich.
International Nickel Co., Inc., New York, N. Y.
International Salt Co., Inc., Scranton, Pa.
International Silver Company, Meriden, Conn.
Jefferson Chemical Company, Inc., New York, N. Y.
Kilgore, Inc., Westerville, Ohio
Koppers Company, Inc., Pittsburgh, Pa.
Kwikset Locks, Inc., Anaheim, Calif.
LaBelle Industries, Inc., Oconomowoc, Wisc.
Lambert Pharmacal Company, St. Louis, Mo.
Little, Arthur D., Inc., Cambridge, Mass.
Mason, L. E., Company, Hyde Park, Mass.
Mathieson Chemical Corporation, Baltimore, Md.
Merck & Company, Inc., Rahway, N. J.
Milwaukee Stamping Co., Milwaukee, Wisc.
Moe Light, Inc., Ft. Atkinson, Wisc.
Monarch Aluminum Mfg. Co., Cleveland, Ohio
Monsanto Chemical Company, St. Louis, Mo.
Mundet Cork Corporation, New York, N. Y.
National Fireworks Ordnance Corp., West Hanover, Mass.
Niagara Alkali Company, New York, N. Y.
Niagara Blower Co., New York, N. Y.
Nopco Chemical Co., Inc., Harrison, N. J.
Oldbury Electro-Chemical Co., Niagara Falls, N. Y.
Olin Industries, Inc., East Alton, Ill.
Oronite Chemical Company, San Francisco, Calif.
Parsons, Ralph M., Company, The, Los Angeles, Calif.
Pemco Corporation, Baltimore, Md.
Penick, S. B., & Company, New York, N. Y.
Pennsylvania Salt Manufacturing Co., Philadelphia, Pa.
Pfister Chemical Works, Inc., Ridgefield, N. J.
Pfizer, Chas. & Company, Inc., Brooklyn, N. Y.
Philco Corporation, Philadelphia, Pa.
Phillips Petroleum Company, Bartlesville, Okla.
Pittsburgh Coke & Chemical Co., Pittsburgh, Pa.
Rau Fastener Co., The, New York, N. Y.
Ric-wiL Company, Cleveland, Ohio
Rohm & Haas Company, Philadelphia, Pa.
Rowe Manufacturing Company, Whippany, N. J.
Rudy Manufacturing Co., Dowagiac, Mich.
Shea Chemical Corp., Baltimore, Md.
Shell Development Company, Emeryville, Calif.
Sheller Mfg. Co., Dryden Rubber Div., Chicago, Ill.
Sherwin-Williams Company, The, Cleveland, Ohio
Shwayder Bros., Inc., Denver, Colo.
Sprague Electric Company, North Adams, Mass.
Standard Oil Company (Indiana), Chicago, Ill.
Standard Oil Development Co., New York, N. Y.
Standard Products Company, The, Cleveland, Ohio
Stauffer Chemical Company, New York, N. Y.
Stewart Die Casting, Chicago, Ill.
Sun Oil Company, Philadelphia, Pa.
Tennessee Eastman Corporation, Kingsport, Tenn.
Tranter Manufacturing, Inc., Lansing, Michigan
Unexcelled Chemical Corp., Cranbury, N. J.
Union Carbide & Carbon Corp., New York, N. Y.
United Carr-Fastener Corp., Cambridge, Mass.
United States Rubber Company, New York, N. Y.
Universal Match Corp., Ferguson, Mo.
Victor Chemical Works, Chicago, Ill.
Vulcan Copper & Supply Co., The, Cincinnati, Ohio
Wallace & Tiernan Products, Inc., Newark, N. J.
Westvaco Chemical Division, New York, N. Y.
Witco Chemical Company, Chicago, Ill.
Wyandotte Chemicals Corp., Wyandotte, Mich.
Zaremba Company, Buffalo, N. Y.
Zenith Plastics Company, Gardena, Calif.

Companies listed in bold face type are Sustaining Members

CHEMICAL CORPS KEY PERSONNEL

OFFICE OF THE CHIEF CHEMICAL OFFICER
Chief Chemical Officer—Major General Egbert F. Bullene
Deputy Chief Chemical Officer—Brigadier General Charles E. Loucks
Executive Officer, OCCm10—Colonel DeLancey R. King
Chief, Administration Division—Colonel Norman D. Gillet
Chief, Plans, Training and Intelligence Division—Colonel Ralph B. Strader
Chief, Research and Development Division—Colonel Marshall Stubbs
Chief, Materiel Division—Colonel Claude J. Merrill
Comptroller of the Chemical Corps—Colonel James H. Batte
Legal Advisor—Lt. Colonel Herbert K. Greer
Chief, Program Coordinating Office—Colonel Robert W. Breaks

ARMY CHEMICAL CENTER, MARYLAND
HEADQUARTERS
Commanding General—Brigadier General William M. Creasy
Vice Commander—Colonel Frederick W. Gerhard
Deputy Post Commander—Colonel Walter L. MacLachlan

FIELD OFFICE, CHIEF CHEMICAL OFFICER
OFFICE OF THE INSPECTOR GENERAL
CmlC Inspector General—Colonel Russell W. Dodds
OFFICE OF THE SENIOR SCIENTIFIC ADVISOR
Adm and Liaison Officer—Lt. Colonel John A. Bacon Jr.

SEPARATE ACTIVITIES
CHEMICAL CORPS BOARD
President—Colonel Leonard M. Johnson
CHEMICAL CORPS HISTORICAL OFFICE
Historical Editor—Major Sumner S. Wilson
CHEMICAL CORPS OPERATIONS RESEARCH GROUP
Director—Lt. Colonel John A. Bacon Jr.

CHEMICAL CORPS MATERIEL COMMAND
HEADQUARTERS
Commanding General—Brigadier General Henry M. Black
Deputy Commander—Colonel Harold Walmsley
ARMY CHEMICAL CENTER INSTALLATIONS
Edgewood Arsenal
Commanding Officer—Major John Moran
Eastern Chemical Depot
Commanding Officer—Colonel John P. Youngman
Inspection Equipment Agency
Commanding Officer—Captain John Marrero
Technical Escort Detachment
Commanding Officer—Colonel Garland M. White
PROCUREMENT DISTRICTS
Atlanta Chemical Procurement District, Atlanta, Georgia
Commanding Officer—Major John H. Eller
Boston Chemical Procurement District, Boston, Massachusetts
Commanding Officer—Colonel Dominic J. Chiminiello
Rocky Mountain Arsenal Procurement Office, Chicago, Illinois
Commanding Officer—Colonel Donald G. Grothaus
Pine Bluff Arsenal Procurement Office, Dallas, Texas
Commanding Officer—Lt. Colonel Hans S. Bendixen
New York Chemical Procurement District, New York, New York
Commanding Officer—Colonel Joseph F. Escude
San Francisco Chemical Procurement District, Oakland, California
Commanding Officer—Colonel George W. Dorn
DEPOTS
Deseret Chemical Depot, Tooele, Utah
Commanding Officer—Colonel John D. Tolman
Midwest Chemical Depot
Asst. for Depot Operations—Lt. Colonel Ralph B. Cummings
Atlanta General Depot, Atlanta, Georgia
Section Chief—Lt. Colonel Virgil A. Willson
Memphis General Depot, Memphis, Tennessee
Section Chief—Lt. Colonel Carl E. Grant
New Cumberland General Depot, New Cumberland, Pennsylvania
Section Chief—Major Alva G. Bearden
San Antonio General Depot, San Antonio, Texas
Section Chief—Lt. Colonel Gail A. Eaton
Utah General Depot, Ogden, Utah
Section Chief—Major Carlos L. Byers
ARSENALS
Pine Bluff Arsenal, Arsenal, Arkansas
Commanding Officer—Lt. Colonel John J. Hayes
Rocky Mountain Arsenal, Denver 2, Colorado
Commanding Officer—Colonel Adam W. Meetze

CHEMICAL CORPS RESEARCH AND ENGINEERING COMMAND
HEADQUARTERS
Commanding General—Brigadier General William M. Creasy
Deputy Commander—Colonel William R. Currie
ARMY CHEMICAL CENTER INSTALLATIONS
Chemical Corps Chemical and Radiological Laboratories
Commanding Officer—Colonel Fred J. Delmore
Chemical Corps Medical Laboratories
Commanding Officer—Colonel Norman W. Elton
Chemical Corps Engineering Agency
Commanding Officer—Colonel Willis R. Givens
Chemical Corps Research Procurement Agency
Commanding Officer—Lt. Colonel Harry C. Gilbert
OTHER INSTALLATIONS
Camp Detrick, Frederick, Maryland
Commanding Officer—Lt. Colonel John W. Fitzpatrick
Dugway Proving Ground, Tooele, Utah
Commanding Officer—Colonel Donald H. Hale
Fort Terry, New York
Commanding Officer—Lt. Colonel Don L. Mace

CHEMICAL CORPS TRAINING COMMAND
HEADQUARTERS
Commanding Officer—Colonel John R. Burns
Deputy Commander—Colonel Richard R. Danek
CHEMICAL REPLACE TRAINING CENTER
Lt. Colonel Edgar V. H. Bell
CHEMICAL CORPS SCHOOL
Commandant—Colonel Edwin Van Keuren
DOCTRINE BOARD
President—Colonel Donald E. Yanka
COMPOSITE TROOP UNIT
Commanding Officer—Major Joe Duncan

OVERSEAS THEATER CHEMICAL OFFICERS
FECOM—Colonel Jacquard H. Rothschild
EUCOM—Colonel Ragnar E. Johnson
USFA—Captain Robert R. Frazier
TRUST—Captain Edwin C. Pittenger Jr.
USARCAR—Colonel George R. Oglesby
USARAL—Colonel Laverne A. Parks
USARPAC—Lt. Colonel James R. Chapman
US ARMY SECTION JBUSMC—Lt. Colonel Albert B. Delmonte

ARMY CHEMICAL OFFICERS
FIRST ARMY, GOVERNORS ISLAND, NEW YORK—Colonel Walter A. Guild
SECOND ARMY, FORT GEORGE G. MEADE, MARYLAND—Colonel Raymond T. Beurket
THIRD ARMY, FORT McPHERSON, GEORGIA—Colonel Robert D. McLeod
FOURTH ARMY, FORT SAM HOUSTON, TEXAS—Major Herman W. Sheriff
FIFTH ARMY, CHICAGO, ILLINOIS—Colonel Stoessel S. Barksdale
SIXTH ARMY, PRESIDO OF SAN FRANCISCO, CALIFORNIA—Colonel Roy W. Muth
SEVENTH ARMY, EUCOM—Colonel Ronald L. Martin
EIGHTH ARMY, FECOM—Colonel David Armitage
MILITARY DISTRICT OF WASHINGTON—Major Arthur M. Frey

TECHNICAL ARTICLE

VARIABLES IN VISCOSITY MEASUREMENTS WITH DILUTE NAPALM SOLUTIONS

BY BERNARD M. ZEFFERT AND MARJORIE F. BUCKLES
U. S. Army Chemical Corps, Washington 25, D. C.

The study of variables in viscosity measurements with dilute napalm solutions was started with a view to determining the feasibility of using such measurements as the basis for a field specification test for gasoline used in preparing incendiary gels.

Viscosity measurements are used to determine the size, shape and molecular aggregation of polymers in solvents, and may be used to characterize different solvents with respect to a given polymer. Flory (1) has suggested that the shape assumed by linear macromolecules in solution is related to the nature of the solvent. Alfrey, Bartovics, and Mark (2) have supported this theory, as have Cragg and Rogers (3), finding evidence that the intrinsic viscosity is very sensitive to the shape assumed by a flexible long-chain molecule in solution and that this shape varies with the nature of the solvent and with temperature.

The terminology of intrinsic viscosity and related functions has been discussed by Cragg (4) in an attempt to clarify some of the definitions. In this discussion the symbols are defined as follows:

c = concentration of solute in grams per 100 cc.
n_o = viscosity of solvent.
n_s = viscosity of solution.
$n_s/n_o = n_r$ = relative viscosity.
$(n_s-n_o)/n_o = n_{sp}$ = specific viscosity.
n_{sp}/c = reduced viscosity.
$\lim_{c\to o} (n_{sp}/c) = [n]$ = intrinsic viscosity.

Extrapolation of the n_{sp}/c vs. c line gives $[n]$, which is a measure of the volume of solution occupied by a single particle.

Tests with solutions of low viscosity are usually simpler and more reproducible than tests with gels, and the viscosity characteristics of dilute solutions of a napalm polymer (or other liquid fuel thickener) may be useful as criteria of the value of different solvents in preparing gel mixtures. In order to determine the value of these criteria in a field test, the effect of certain variables, controlled readily under laboratory conditions but often with difficulty in the field, must be asessed. These variables include the storage conditions of the napalm and the fuel and the facilities for preparing solutions and measuring viscosities, in addition to the normal temperature and concentration factors.

In this study, room temperatures were used for most preparative operations and for storage. Viscosity measurements were made with calibrated Cannon-Fenske-Ostwald viscometers in a thermostated bath at 25°C. Interest was centered upon the effects of the aforementioned variables on the reproducibility of the test measurements. The temperature and concentration factors, which occur in all physical measurements of solutions, were fixed by comparing viscosities of equally concentrated solutions at a constant temperature.

Work done initially showed that the viscosities of dilute napalm solutions tend to decrease with time of exposure; also viscosities tend to decrease with time at a gradually decreasing rate when stored under dry conditions.

A more comprehensive study was then made with two concentrations of napalm in dry benzene (0.1% and 0.5%) to determine the effects of various storage and handling conditions over a fixed period of time.

Because of the nature of the study a statistical approach was used. A program was set up for each concentration level whereby the effects of four variables were tested simultaneously Relative viscosity values obtained at 25°C. were compared for 16 solutions by a Latin square arrangement. Two of the factors tested for their effect on the viscosity of dilute solutions were the humidity conditions under which the napalm and the prepared solutions were stored. Special techniques were designed to minimize the time of exposure while weighing and during the preparation of solutions.

No precautions were taken to prevent moisture pick-up during viscosity measurements other than covering the open ends of the viscometers until samples reached equilibrium in the bath and readings were begun. Five or six successive readings were made as rapidly as possible and the aliquots were then discarded.

The effects of two mixing procedures and of cumulative atmospheric exposure of the solutions at the time of sampling were also evaluated.

Summarizing tables (Tables 1 and 2) were prepared from the data obtained by the Latin square arrangements to show qualitatively the effects of the factors tested on the relative viscosities of the solutions. A complete factorial analysis including all possible interactions was not considered necessary since the degree of variation of each factor was arbitrarily chosen. No attempt was made to determine the optimum conditions for viscosity measurements, but only to choose conditions which would later allow correct assessment of differences due to the nature and condition of the solvent. The tables were prepared to show the effect of each variable during a 10-day

test period. Each value given represents an average of eight or more observed values.

Factors Tested

Factor A: Moisture content of the napalm.
- A_1 = prepared from napalm stored at 0% relative humidity.
- A_2 = prepared from napalm stored at 70% relative humidity.

Factor B: Storage of prepared solutions.
- B_1 = sealed with parafilm, stored at 0% relative humidity.
- B_2 = sealed with parafilm, stored in room.

Factor C: Solution procedure.
- C_1 = mechanical shaking started immediately.
- C_2 = mechanical shaking started after standing 3 days.

Factor D: Sampling treatment.
- D_1 = aliquot removed once daily.
- D_2 = aliquot removed three times daily.

TABLE I

Average Relative Viscosity of 0.1% Napalm-Benzene Solutions at 25.0° C.

Sample Category	Number of Days of Mixing 1	2	3	10
A_1	1.44 ± .03	1.48 ± .03	1.44 ± .03	1.29 ± .05
A_2	1.46 ± .05	1.47 ± .05	1.43 ± .05	1.28 ± .06
B_1	1.45 ± .02	1.48 ± .03	1.44 ± .02	1.34 ± .055
B_2	1.46 ± .06	1.47 ± .06	1.43 ± .06	1.24 ± .03
C_1	1.48 ± .04	1.51 ± .03	1.46 ± .04	1.26 ± .04
C_2	1.42 ± .02	1.44 ± .03	1.41 ± .03	1.32 ± .07
D_1	1.41 ± .03	1.46 ± .04	1.43 ± .05	1.29 ± .03
D_2	1.46 ± .03	1.48 ± .04	1.43 ± .04	1.28 ± .07

TABLE 2

Average Relative Viscosity of 0.5% Napalm-Benzene Solutions at 25.0° C.

Sample Category	Number of Days of Mixing 1	2	3	10
A_1	8.4 ± .5	7.7 ± .5	7.2 ± .4	5.8 ± .6
A_2	8.5 ± .7	7.7 ± .4	6.7 ± .4	5.2 ± .6
B_1	8.3 ± .3	7.8 ± .5	7.1 ± .4	6.1 ± .3
B_2	8.7 ± .8	7.6 ± .6	6.8 ± .5	4.9 ± .5
C_1	8.8 ± .7	8.0 ± .3	7.3 ± .2	5.3 ± .7
C_2	8.2 ± .3	7.5 ± .4	6.6 ± .3	5.6 ± .5
D_1	8.5 ± .7	7.5 ± .5	6.9 ± .4	5.6 ± .5
D_2	8.4 ± .5	7.9 ± .3	7.0 ± .5	5.4 ± .7

Humidity Variation in Napalm

The work of other investigators has shown the moisture content of napalm to be variable and probably related to the physical properties and stability of napalm gels (5), and some work has been done on dilute napalm solutions as well (6), with similar findings.

Samples of Eakins Napalm "A" (used throughout this investigation) were stored in shallow dishes in a desiccator over phosphorus pentoxide and, for comparison, other portions were stored over a sulfuric acid solution at 70% relative humidity. All samples were weighed daily over the period of a week. Equilibrium was apparently attained in one day, during which time the dried samples lost 0.5% in weight and the humidified material gained 1.5%.

Tests with equal weight-per cent solutions made with C.P. benzene which had been stored over sodium wire indicate that the viscosities of solutions made from dried napalm were slightly greater than those made from humidified material. Over the 10-day test period, however, the moisture content of the napalm showed no observable effect on relative viscosities in 0.1% solutions and only a slight effect in 0.5% solutions (see Tables 1 and 2).

Variations in Mixing and Handling

Mechanical shaking at room temperature was chosen for this study after it was shown in preliminary experiments that attempts to shorten dispersal time by raising the temperature during mixing had an adverse effect on viscosity. Solutions refluxed with benzene for one hour had viscosities about 30% lower than solutions shaken mechanically at room temperature for the same period of time. Further refluxing resulted in the viscosity being lowered and reaching a constant value after three hours that was only 8% greater than that of the benzene alone, indicating either that most of the napalm had washed up on the walls of the still pot or that deterioration of the gel was speeded at elevated temperatures. Extrapolation of the rate of viscosity decrease for the unrefluxed solutions indicates that a 30% loss would not be attained at normal temperatures.

Samples stored for three days after mixing of components, and then placed in the mechanical shaker, showed slightly lower viscosities over the 10 day test period than did those samples agitated immediately after mixing.

A comparison of viscosities of solutions from which aliquots were removed three times daily with solutions which were sampled once daily showed that the frequency of exposing the samples within these limits had negligible effect on viscosity.

At both concentrations, the solutions sealed with parafilm and stored in the room showed a greater decrease in viscosity at the end of ten days than did those sealed with parafilm and desiccated at 0% relative humidity for the same time, but the effect was not discernible for at least three days.

Reproducibility of Measurements

The data shown in Tables 1 and 2 are evidence of the good reproducibility of the measurements. As a further check, two sets of duplicate solutions were prepared from napalm stored at 0% and at 70% relative humidity. These solutions contained 0.3% of napalm by weight. Mechanical shaking was started immediately upon mixing. Solutions were stored at 0% relative humidity between measurements and aliquots were removed twice for viscosity determinations. Results are given in Table 3.

TABLE 3

Relative Viscosity of 0.3% Napalm-Benzene Solutions at 25° C.

Sample Category	Number of Days of Mixing 8	13
A_1 (1)	2.92	2.64
A_1 (2)	2.99	2.73
A_2 (1)	3.14	2.72
A_2 (2)	3.12	2.96

The results of the foregoing series of tests, all made using dry benzene solvent, show that it is quite feasible to make accurate, reproducible viscosity measurements with a normal napalm product in dilute solution. No special techniques were required in preparation or handling of the solutions that are not possible to duplicate in field testing.

Higher test temperatures and humidities would probably have produced greater variation in viscosities, but it was decided to postpone investigation of more rigorous conditions as not being warranted unless further tests in the program showed promise.

The next step was to measure the extent of variation in the viscous properties of the given napalm "standard" with solvents of varying type, including good and poor gasoline fuels, and to assess the effect of the moisture content of the solvents themselves.

It was concluded from the foregoing experiments that good conditions for obtaining reproducible results in measuring viscosities of dilute napalm solutions include the use of napalm stored at 0% relative humidity, mechanical shaking at room temperature for several hours, and immediate measurement of viscosity. To determine the effect on viscosity contributed by the nature of the solvent, solutions were prepared according to the conditions listed above, using several solvents, all of which had been dried over calcium hydride.

The reduced viscosities n_{sp}/c were calculated from the observed viscosities determined at 25° C. and were plotted against concentration in Figure 1.

In Table 4, n_{sp}/c values have been obtained from the plots in Figure 1.

TABLE 4

Reduced Viscosity of Napalm in Dry Solvents at 25.0° C.

Solvent	Aniline Point °F	n_{sp}/c		
		c=0.08	c=0.20	c=0.35
benzene, Baker, C. P.	Miscible	4.8	8.0	11.0
n-octane, Eastman, Reagent grade	Ca. 160	1.2	3.2	5.0
motor pool gasoline (E645)	110.3	5.8	10.3	14.2
test solvent*	120	5.1	9.0	13.8
"poor" gasoline (#8700)	89	—	3.7	4.0

*Test solvent: Mixture simulating gasoline containing 18% benezene, 20% cyclohexane, 57% *n*-heptane and 5% 2,2,4-trimethylpentane.

The intrinsic viscosities in benzene, test solvent, and post motor pool gasoline are about the same, while those in *n*-octane and the "poor" gasoline (selected as a gasoline known to give poor gels when mixed with napalm) are considerably smaller, indicating much less swelling of the napalm in the latter. Reduced viscosity values for benzene, test solvent, and the good gasoline are fairly close with the deviations from linearity probably indicative of micellar swelling (2, 7). The curve for benzene diverges from the others at higher concentrations due to the effect of c, which is in terms of volume concentration. If weight percentages are used, the higher density of benzene does not affect the values, and the lines fall closer together over the concentration range measured.

The effect of moisture in the solvent was the next consideration. Solutions were prepared containing 0.5% by weight napalm in the same solvents used for the previous determinations. A series of solutions was made using the solvents (a) as received, (b) after drying over calcium hydride, and (c) after shaking with water and decanting.

In Table 5 the reduced viscosity, n_{sp}/c, values have been calculated from the observed viscosities at 25.0° C.

TABLE 5

Reduced Viscosity of Napalm Solution at 25.0° C.

Solvent	n_{sp}/c (c=0.3 to 0.4 g/100 cc solution)		
	solvent dried over CaH_2	solvent as received	solvent shaken with H_2O*
benzene	12.3	—	5.3
n-octane	5.2	—	3.4
motor pool gasoline (E645)	14.5	12.3	—
test solvent	14.2	13.7	8.5
"poor" gasoline (#8700)	4.0	3.8	2.9

*All solvents after decanting contained less than 0.1% moisture by distillation analysis.

Viscosities of napalm solutions made from motor gasoline (E645) as received and after drying were measured at 25° C. Reduced viscosity values were calculated from these, and are shown graphically in Figure 2.

It is apparent from the data in Table 5 and Figure 2 that a fairly good solvent, such as benzene, gives a reduced viscosity value after being saturated with water that is of the same order as that for *n*-octane, which is a "poor" solvent even when dry, although the amount of moisture picked up by the benzene is small enough to present difficulties in analysis. The test solvent and motor pool gasoline show the same effect.

A very small percentage of moisture in the solvent represents a considerable amount of water when compared with the amount of napalm used. In the field, control of moisture in the hydrocarbon might present a problem and analysis, in any case, would be difficult.

It is apparent that viscosity measurements of dilute solutions will not constitute a good field method for evaluating gasolines to be used in napalm gels, since normal changes in solvent moisture content may cause variations of the same order as the differences between good and poor solvents.

BIBLIOGRAPHY

1. Flory, *J. Chem. Phys. 10*, 51 (1942).
2. Alfrey, Bartovics & Mark, *J. Am. Chem Soc. 64* 1557 (1942).
3. Cragg & Rogers, *Can. J. Res. 26*, Sec. B, 230 (1948).
4. Cragg, *J. Coll. Sci. 1*, 261 (1946).
5. Unpublished source.
6. Sheffer, *Can. J. Res. 26*, Sec. B, 481 (1948).
7. Mark & Tobolsky, "High Polymers", Second Edition, Vol II, pp. 283-90, Interscience Publishers, Inc., New York, N. Y., 1950.

FIGURE 1.

NAPALM in DRY SOLVENTS at 25° C

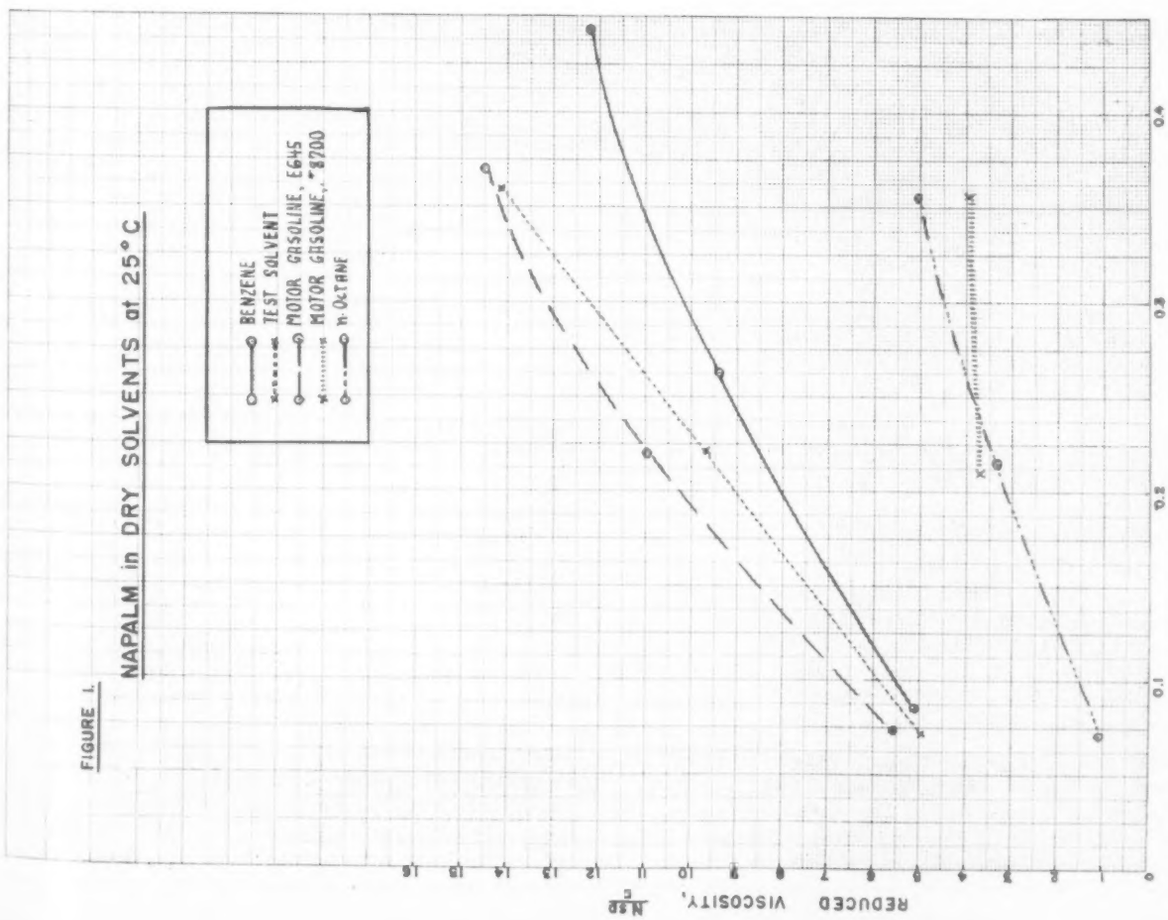
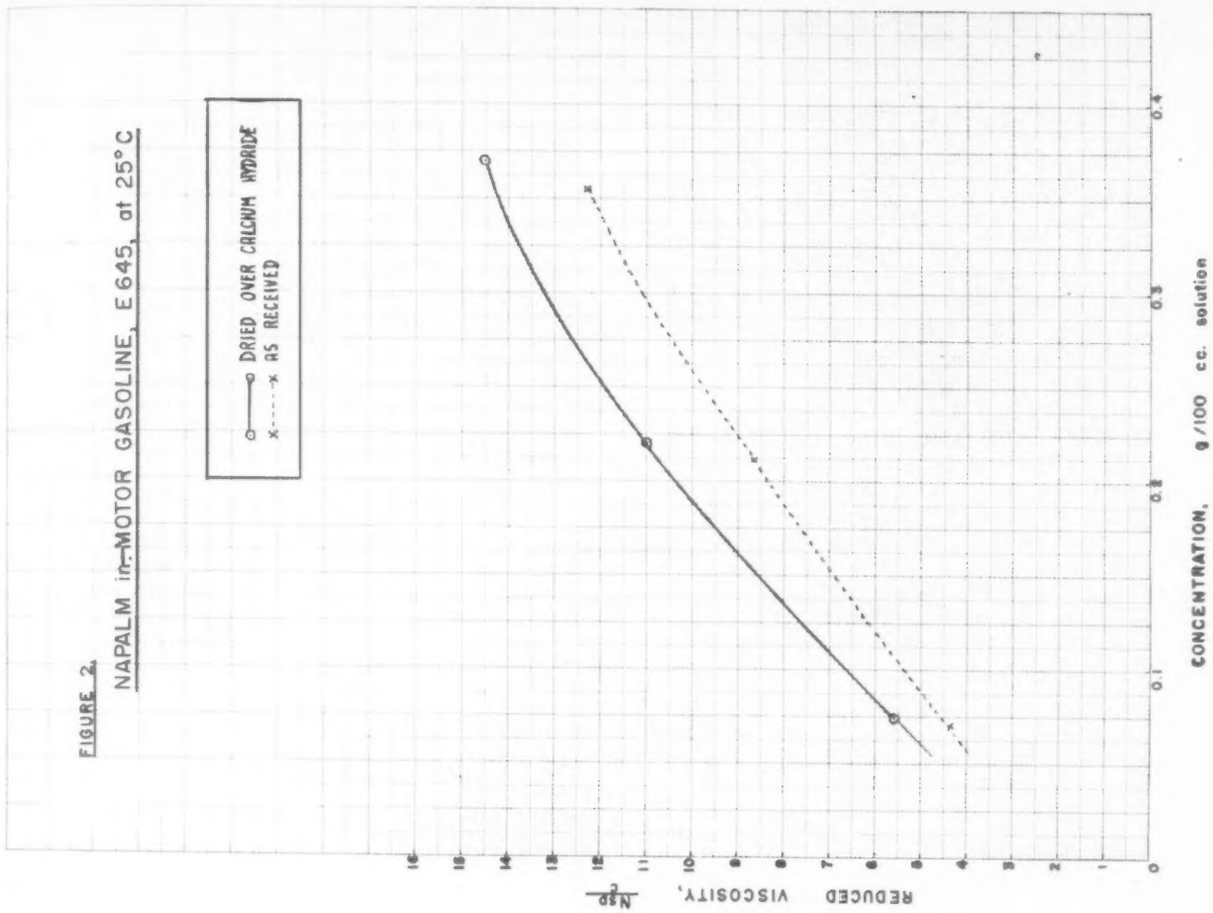


FIGURE 2.

NAPALM in MOTOR GASOLINE, E 645, at 25° C



TOP LEVEL CIVIL DEFENSE TRAINING

(Continued from page 6)

Because the rescue course demands the muscle and agility necessary to raise and climb ladders, clamber through windows, and crawl through tunnels, persons who are not in good physical condition are advised not to take it. Qualified students may enroll by applying to the Director of the Center.

The course covers methods of organizing and training rescue squads, care and use of rescue tools, handling casualties, fire fighting, tunneling through wreckage, lashing and rigging, use of ladders and hoisting devices, shoring and breaching walls, and coping with the hazards of damaged utilities, such as broken gas mains, power lines, and water pipes.

The course is divided into two phases. The first week is devoted to teaching and demonstrating rescue techniques, with opportunities for individual practice by the students. During the second week these lessons are applied by the students' participation and training in team leadership. Each student is given a chance to lead a squad into a damaged area, study the problem, and direct the squad in the removal of casualties. The completion of the two weeks' course qualifies students to use highly specialized equipment and techniques for rescuing trapped victims from upper floors of tall structures and from underground spaces.

To give realism to this training, "Rescue Street" was erected in 1952 under the brow of the hill on which the Center's administration building stands. The street consists of a row of five typical American buildings specially designed to reproduce conditions which would result from bombing. The designs were developed from studies of the damage caused by the bombings of Hiroshima and Nagasaki.

The weird structures represent the ruins of a two-story wooden dwelling, a two-story brick house, a three-story office and apartment building, a five-story business building, and a two-story theatre and store block. These buildings provide a setting for rescue operations under almost every conceivable emergency situation. Students get practical experience by working in the ruins, finding and removing simulated casualties.

Night Classes and Exercises

On the second Thursday night of each rescue course, students of the Staff College and Rescue School combine with civil defense units from nearby cities and towns in a public demonstration. After a simulated bomb burst over the area, the Center's rescue trucks and fire appartus from surrounding communities respond to an air raid siren, radiological monitoring teams explore the scene, wardens and firemen put out real fires in the devastated buildings, and rescue squads extricate simulated casualties concealed in the ruins, lower them from windows, carry them down ladders, and send them to first-aid stations.

These realistic demonstrations of civil defense in action have attracted many spectators from Washington and other cities and towns in Maryland and Virginia. Future demonstrations are scheduled to be given from 8 P.M. to 10 P.M. on Oct. 22, Nov. 5, and Dec. 17.

Graduates of the Rescue School return to their own communities prepared to establish similar training courses for civil defense volunteers. The training program is planned on the "multiplier principle," under which each instructor trains others, who in turn teach local volunteers until the need for civil defense workers in the community is met.

Rescue School graduates are given complete plans and specifications for building their own basic training sets like that which forms a part of "Rescue Street." These sets combine the best features for basic fire fighting and rescue training and cost little to build. They may be constructed from abandoned or condemned buildings.

FCDA urges that every community, depending on its size, build one or more of these basic sets as a means of training needed volunteers and of creating community interest in civil defense. More than 80 have been constructed in cities throughout the country, including three in Baltimore.

"Basic rescue techniques learned in FCDA schools should be given to large numbers of people in every block in every city, and to workers in every plant, hospital, school, office building or other place where large numbers of people are assembled," Col. C. M. White, Assistant FCDA Administrator, Education Services, says. "If disaster strikes, they will be in a position to be of considerable help to their neighbors and fellow workers in the protection of life and property. When regular fire-fighting and rescue services are overwhelmed, the ability of the fire and rescue wardens to handle a multitude of small fires and rescue operations may very well provide the margin for survival.

"The basic training set is a means of taking civil defense out of the realm of theory and making it realistic to the people through actual fire-fighting and rescue operations. It will create competence in those operations and also do much to stimulate a community spirit and a community interest in civil defense which cannot be attained in any other way."

Other Activities

Besides the Staff College and Rescue School, the National Civil Defense Training Center conducts special courses and conferences designed to meet the needs of special civil defense groups and cooperating organizations.

The Center is always making efforts to find better training methods, materials and programs to build a stronger civil defense. The faculty is constantly revising the curricula to fit the needs of State and local civil defense programs. Special assistance is given to all governmental agencies and industrial organizations desiring to establish civil defense training schools.

Many private and governmental organizations cooperate with the Training Center in research aimed toward a better civil defense. The staff is familiar with civil defense activities in other friendly nations, and channels are established for a continuous exchange of training information and experience. Members of the faculty have visited British and Canadian civil defense schools and representatives from those institutions have visited the National Civil Defense Training Center.

A comprehensive library of civil defense books, pamphlets, film slides, and motion pictures is maintained by the Center. State, city, industrial, and institutional civil defense plans are available for study by those who attend its courses.

Tuition at the Center is free. A charge of $5 a day is made for room and meals. There is no provision in the law whereby FCDA can subsidize the travel and living expenses of students. Only students may live at the Training Center. Nearby accommodations may be obtained for members of students' families.

Graduates of the National Civil Defense Training Center have frequently expressed their appreciation of the training they received. Typical of their comments are those of Brigadier General F. W. Makinney, Adjutant General, Hawaii National Guard, who wrote:

"I would like to commend the staff and faculty of the National Civil Defense Staff College for the outstanding instruction presented to Class 74, Administrative and Operations Course recently completed. I was a member of this class, and the instruction received will be helpful to me particularly in my assignment as Director, Territorial Civil Defense Agency, Territory of Hawaii. I was indeed impressed with the intense interest and enthusiasm displayed by the instructors, and their superior method of presentation. I consider this course one of the most informative and interesting I have ever attended."

Gun squad of Company A, 98th Chemical Battalion firing in support of the 127th Infantry, 32nd Division. The 4.2 mortars fight a bitterly resistant battle to gain headway along the Villa Verde Trail.

A gun position of Company A, 98th Chemical Mortar Battalion on the Villa Verde Trail after a three-night battle with the Japanese. The type of terrain can be well seen from the background.

98TH CHEMICAL

By ALEXANDER BATLIN
Lt. Colonel, Chemical Corps

During the initial planning for the Philippine campaigns by Hdqs. S. W. Pacific Area, it was determined that a chemical mortar battalion would be required in the support of 6th Army elements in this operation. There were at that time no mortar battalions available in this theater and the request of the War Department that one be furnished was refused due to the greater priority of the European Theater and the shortage of trained units in existence. Permission was granted to reorganize an existing unit within the theater into a mortar battalion. This is the story of how a tank destroyer battalion was converted into a chemical mortar battalion and successfully accomplished its missions. In March 1944 the 641st Tank Destroyer Battalion, then stationed at Oro Bay, New Guinea, turned in its tank destroyers and was issued 4.2" chemical mortars. From then until September 1945 the battalion fought its way to the furthermost tip of New Guinea and through northern Luzon, as a chemical unit.

The 641st Tank Destroyer Battalion was organized in January 1942 from elements of the 41st Division, Oregon National Guard. After maneuvers in the U. S., the battalion was sent to Australia as one of the component parts of the 41st Division. Training continued at various places in Australia and for a while the battalion was in position in the defense of northern Australia. It furnished a company that went to New Guinea in November 1942 to take part in the Salamau campaign. The balance of the battalion followed to Oro Bay, New Guinea, in January 1943, and formed the part of the defense garrison at this base. Up to the time of its conversion to a 4.2 battalion, the 641st had not seen any action as a tank destroyer battalion, although it had been gathering experience and training as a unit, and invaluable knowledge of how to live and operate under jungle conditions. At this time the battalion had among its officers infantrymen, field artillerymen, cavalrymen and engineers.

In late February 1944 the battalion was issued 4.2 chemical mortars and was attached to the 1st Cavalry Division for the campaign against the Admiralty Islands. The chemical officer of the First Cavalry Division made a special trip to Brisbane to gather the complete theater stock of manuals on operation of the 4.2. With the aid of these manuals and the help of the Chemical Section, 1st Cavalry Division, the battalion began training its gun crews in operation of the mortars. Utilizing the experience gathered in the operation of tank destroyers, forward observers, and fire direction, central groups already existed within the battalion. There was also in existence first rate communications sections and mortar maintenance crews. These made the transition much smoother than it would have been under other conditions. At the last moment it was decided that the battalion would not accompany the 1st Cavalry Division on this operation, and the battalion was then made available in support of I Corps in the operation against Hollandia.

In January of 1944, the theater requested that five chemical warfare officers trained in the use of the mortar be sent out from the U. S. to augment the battalion personnel and to train the unit in its chemical warfare missions. I was fortunate enough to be chosen as the senior officer of the group and, although only two of us actually joined the battalion, I had the

Gun squad of Company A, 98th Chemical Mortar Battalion has just gotten one round "on the way." This action is taking place high on the Villa Verde Trail on the Luzon, P.I.

The mortar positions of Company A, 98th Chemical Battalion along the Villa Verde Trail The men are resting after having repulsed three Japanese infiltration attempts to wipe out the crews of the guns.

L MORTAR BATTALION

pleasant experience of commanding this battalion as a chemical unit. At this time the battalion could execute high explosive missions quite satisfactorily but was inadequately trained to carry out smoke missions, and any toxic gas missions would have been out of the question. To remedy this, three of the company commanders and three platoon leaders were sent to the chemical warfare school at Oro Bay where they took a gas officers course and also received special training in the employment of smoke. News that a mortar battalion had been organized in New Guinea spread around rapidly and soon a number of eager young chemical officers requested transfer into the battalion. These also having been trained at the chemical warfare school at Edgewood had the knowledge and ability to greatly assist in the internal training in the employment of smoke and toxics.

On April 11, 1944, the battalion saw its first action at Hollandia, Dutch New Guinea, where Company B landed at Aitape with the task force that protected the 6th Army's left flank. The balance of the battalion landed on either side of Hollandia and fired only a few small missions, one of which was a smoke mission. These were virtually unopposed landings and the greatest enemy the companies found was the mud through which they tried to move in keeping up with the Infantry. Company B moved out of Aitape and joined the task force that was to take part in the operation against the Wakde-Sarmi area. Wakde is a small island off the coast of New Guinea that was required as an air strip. The two platoons from Company B landed first on a really small island close to Wakde and emplaced their mortars so that they covered the landing of the Infantry on Wakde. They then re-embarked and landed on the mainland where they supported elements of the 6th Division in the bloody fighting for Lone Tree Hill. Company D in the meanwhile had been attached to the 41st Division to take part in the Biak Island campaign. The fighting on this Island marked the first encounter in the Pacific with the intensive cave fortifications developed by the Japanese. Mortars were in constant use as their high angle of fire could penetrate openings which flat trajectory weapons could not reach.

The 3rd platoon under the leadership of Lt. (now Major) Ben Bell formed part of a regimental task force that attempted to bypass some of the caves by a flanking move along the beach. The Japanese drove a wedge between the regiment and the main body of the Division. The regiment was then ordered to withdraw by sea and Bell's platoon formed the rear guard which opened fire and kept fire on the hills above the beach until the entire regiment was evacuated. When the last element of the regiment had left the beach, Bell and his men piled up their mortars, removed the sights with them, and two tanks that were with the platoon fired on to the pile of barrels to destroy them. A Dukw came into the beach and evacuated the men with just what they could carry on their backs, leaving the two tanks to fight their way through the Japanese road block. Three days later the mortars were recovered when a successful drive up the beach was made again. However, the tank fire had seriously damaged two of the barrels so that they could not be re-used, and for the rest of the Biak operation the company operated with only two platoons.

Through July, August and September 1944 there was a series of operations in New Guinea in which Company B and then Company A took part, and the beginning of October 1944 found three of the companies back at Hollandia at base camp undergoing refresher training. At this time, accelerated training was carried on within the battalion on the use of smoke. New equipment was being drawn and preparations began for the major operation towards which all 6th Army elements were pointing—the return to the Philippines.

The battalion was assigned to I Corps for the Luzon operation and in turn Corps attached two companies to each of the assault divisions. The companies then left at intervals to join their divisions and train with them in preparation for the assault landings. With the development of the technique of firing mortars from landing craft, a demand was created for trained mortar crews to man these craft. Company A was temporarily attached to the 7th Fleet, and manned four LCI (M)s. The battalion less Company A landed at Lingayen Gulf on 9 January 1945 to begin the longest uninterrupted campaign in its history—173 days in action. During the course of the next 6 months they were to fire 1350 missions and expend 106,685 rounds of ammunition while sustaining 6 killed and 54 wounded. A few of the outstanding incidents that occurred during this campaign will illustrate some of the capabilities of the battalion.

Probably the most outstanding individual was Capt. Gilbert Doolittle, a chemical warfare officer, who joined the battalion in New Guinea. Doolittle had been with the San Francisco Procurement District during the early part of the war and then had a short course at the Infantry School and came to the 98th as one of the chemical warfare complement. He was initially the battalion S-2 but due to the temporary loss of Capt. Frank Stubbs of Company A, Doolittle took command of the Company and fought it through the opening weeks of the campaign.

Late in January the 20th Infantry, 6th Division, to which Company A was attached, moved to clear the Cabaruan Hills. Doolittle, acting as liaison officer, moved forward with Company G as the assault company of the second battalion following a heavy preparatory barrage from both artillery and mortars. The three mortar platoons of the company were prepared to lay down a heavy smoke screen covering the entire enemy area. While Company G was moving into the Hill area, some of the enemy suddenly opened fire from the left and right flanks in the rear. In the meantime Companies E and F were pinned down by heavy fire from a knoll. During the confusion that ensued, Doolittle discovered that he was the only officer still on his feet and ordering his radio operator to open contact with the infantry battalion CP, Doolittle succeeded in halting the withdrawal and in reorganizing Company G. The mortar platoons, also on Doolittle's orders, commenced fire with smoke covering the enemy positions and setting fire to the brush and grass where some of the enemy were hidden. The enemy fire ceased almost instantly and Doolittle re-assembled the remainder of the Infantrymen and organized patrols to go back on the hill and evacuate the wounded. When all of the wounded were safely evacuated, Doolittle withdrew the Infantry back to their starting positions.

During this mission Company A fired 1117 rounds of high explosive and 737 rounds of WP. Doolittle was awarded the Silver Star for his gallantry in this action. Twelve days later, at the town of Munoz, Doolittle was killed while attempting to drive a Japanese tank away from his forward observation post, located well within the Japanese lines. Four men from Company A volunteered and went forward to recover Doolittle's body.

Another outstanding operation was that conducted by Company D at Lupao where in the words of General Mullins, Commanding General 25th Division, "On many occasions the effective and extremely accurate fire of the 4.2 mortar was the deciding factor which enabled a regiment to sense its objective. This was especially true in the attack on Lupao, Luzon, Philippine Islands where the proximity of opposing lines prevented artillery support, and mortar fire was used extensively." In this action two platoons infiltrated behind the Japanese positions in the town and moved rolling fire through the town burning down houses and destroying camouflage around dug-in tanks. The ammunition and supplies were brought in once a day by trucks of the platoon under tank convoy which fought their way in and fought their way out of the platoon positions. The forward observers of the platoons in operation were bringing fire down directly in front of themselves to clear the way for the Infantry assaults. This operation which lasted for three days was only one in a series of operations involving Company D in support of regiments of the 25th Division.

Shortly after Lupao, the concluding operation at the town of San Jose was fought which liquidated the Japanese armored division that had impeded the progress of I Corps divisions. During this phase of the Luzon campaign the 98th Battalion fell back into its original role of tank destroyers and was credited with destruction of 26 Japanese tanks and a share in 16 others. The Luzon campaign was ended as far as the battalion was concerned on the 30th of June 1945. The battalion was re-assembled for the first time in the year and a half at one camp. Intensive training was carried on to train new replacements that had joined the battalion late in June and was to train the battalion as a whole in the firing of smoke and gas missions. The battalion was at its base camp north of San Jose on Highway 5 when the war ended.

Due to its unorthodox origin and the fact that most of the officers and almost all of the enlisted personnel in the battalion had had no formal chemical warfare training, improvision in a great many matters was the rule in this battalion. From the start of the Luzon operation to its conclusion officers were being lost at a steady rate due to rotation and illness. Instead of attempting to get replacements from pools, the battalion used the high caliber of officer material present among its NCO's and 18 were given direct commissions. Of these 18, 16 were given battlefield promotions to 1st Lieutenant before the Luzon campaign ended.

Along administrative lines, battalion headquarters always functioned with an absolute minimum of personnel. Command responsibility was divided in that operational control of the companies was always delegated to the divisions which they supported. However, administrative control which included all personnel matters—Class II and Class IV supply items and maintenance of motor vehicles and communications equipment was kept by battalion headquarters. This retention of administrative command gave the battalion commander flexibility and he could place additional support with the company that needed help most.

It can be readily seen from the way this battalion carried out its missions that only a short training period is required to transfer an organization, trained in the use of crew served weapons using forward observer and fire direction center techniques, to a mortar unit that will be employed primarily for HE missions. However, chemical missions will require a great deal of additional training for operation sections and fire direction centers as well as forward observers.

Olin can help you hit your target

If you need help to hit your production target dates, let the practiced hand of Olin Industries serve you. Over 50 years of experience in conquering problems in metallurgy and explosives chemistry are yours to command. The Olin specialists can demonstrate to you how they tailor explosives and pyrotechnics to your individual demands. Western non-ferrous alloys and fabricated parts are Olin products famous for their quality . . . so are Winchester arms and Western and Winchester ammunition. Constant research has kept the many products of Olin leaders in their fields. So . . . what's *your* problem? If Olin doesn't have the answer already, they *know how* to get it for you. Call or write today.

FOR MORE INFORMATION, CALL OR WRITE... Olin EXPLOSIVES DIVISION

OLIN INDUSTRIES, INC. EAST ALTON, ILLINOIS

FOUR SENIOR OFFICERS RETIRED

Chemical Corps Officers retiring on 31 July were Colonels Hugh W. Rowan, Hubert B. Bramlet, Ralph C. Benner, and James M. McMillin. All had more than thirty years of service, and two—Colonels Rowan and Bramlet—had been with the Corps since its creation in 1917.

HUGH W. ROWAN

Col. Hugh Williamson Rowan was born in 1894 at Newport, R.I., and was graduated from Yale in Chemistry in 1915. After two years of post-graduate work at Harvard, he entered the (then) Chemical Warfare Service in World War I and was cited for service in the Toul, St. Mihiel and Meuse-Argonne campaigns. Among his assignments between the two World Wars was that of assistant military attache, Berlin, 1931-34. In World War II he was the Chief Chemical Officer of the European Theater, and in 1946 was appointed president of the Chemical Corps Board.

In 1951 Col. Rowan became Chief of the Plans, Training and Intelligence Division, office of the Chief of the Chemical Corps which post he held until his retirement. He holds the Legion of Merit, the Bronze Star Medal, and has foreign decorations as Commander of the British Empire and Chevalier of the Legion d'Honneur. His home is 30 Quincy St., Chevy Chase, Md. He is to be advanced on the retired list to the rank of Brigadier General.

RALPH C. BENNER

Colonel Ralph C. Benner was born in Wellston, Ohio in 1894. He entered Ohio State University and later a number of Army schools—among which were the Field Artillery School, Fort Sill, Oklahoma; Chemical Corps School; Army Industrial College in Washington, D.C. and the Command and General Staff College in Leavenworth, Kansas.

He enlisted in the Ohio National Guard in 1915, attended ORC Training Camp and was commissioned a 1st Lieutenant in the Field Artillery in 1917. In 1927, he transferred to the Chemical Corps.

During World War II he spent one year in the Asiatic-Pacific Theater and one month in the European Theater of Operations. He was appointed president of the Chemical Corps Board in 1951, a post he held until his retirement.

Among the decorations he holds are the Legion of Merit, the Bronze Star Medal, and the Army Commendation Ribbon. His permanent address is 4614 Verplank Pl., N.W., Washington, D.C.

HUBERT B. BRAMLET

Col. Hubert B. Bramlet, a native of Eldorado, Ill., enlisted in the Army in 1917 after receiving an A.B. from the University of Illinois in Chemistry. Commissioned in 1918, he attended the CWS School in 1921 and served with the First Gas Regiment for the ensuing three years. In 1924 he obtained an M.S. in chemistry from the University of Illinois and the following year became an instructor in the CWS School. In 1930 he obtained an M.S. in business administration at Harvard. During World War II, he served in the European Theater and in 1947 was appointed 5th Army Chemical Officer, his last service assignment. He was awarded the Bronze Star Medal and the Army Commendation Ribbon.

JAMES M. McMILLIN

Colonel James M. McMillin was born in Youngstown, Ohio. After completing high school in Wilkinsburg, Pa., he attended Carnegie Institute of Technology for one year, then entered the United States Military Academy and was graduated in 1920 and commissioned in the Coast Artillery Corps.

He completed a two-year course in Business Administration at Harvard University and received a Master of Business degree. Other schools attended were Coast Artillery, Chemical Corps and the Army Industrial College.

A few of the positions he held were Supply Depot Commander, Hawaiian Department; Post Commander of Huntsville Arsenal, Ala.; Executive Officer, Chemical Corps Board; and Deputy Post Commander at the Army Chemical Center.

Among Colonel McMillin's decorations are the Asiatic-Pacific Theater Ribbon, and the Philippine Presidential Unit Citation. He expects to reside at 210 North Harvey St., Urbana, Ill.

SECRETARY WILSON'S ADDRESS

(Continued from page 26)

year to make sure that we have the best possible military plans and military strength that we can afford over a period of years. To do this we must keep our production programs as flexible as possible by not making commitments out any farther than necessary.

Our defense program is a sound one and the money we are currently requesting is sufficient for the program. We are making every effort to get the maximum security possible for the money we spend. Our budget requests are also based on another well-recognized principle, namely, that money will be more effectively spent for the purpose if excess authorizations and funds are not available for easy spending.

Our program has been given a great deal of thought and has been carefully analyzed not only by the officials in the Defense Department but by the National Security Council and the President himself. In his speech of May 19th he said, (quote), *"There must be—far from any slackening of effort—a speeding, a sharpening, a concentration that will extract the last cent of value from every dollar spent. Our defense establishment has yet to reach the level of performance we want. Until it has, we shall not rest.*

"I have given to this phase of our national planning careful, personal study and analysis. I have, as you know, lived with it for many years. I have also sought, of course, advice from the most competent people I could find.

"Let me tell you how we approached this analysis. We did not set any fixed sum of money to which our defense plans had to be fitted. We first determined what is truly vital to our security. We next planned ways to eliminate every useless expendure and duplication. And we finally decided upon the amount of money needed to meet this program." (unquote).

I know of no one in the whole world more competent to judge such matters than our President. He has approved the budget which we are proposing and the progress we expect to make in increasing the military strength of the nation.

Have Won Wars But Not Peace

In any discussion of military programs it is easy to lose sight of our ultimate aim—a secure and lasting peace. In the Defense Department and in our government we are actively

(Continued on next page)

THE HISTORICAL CORNER

By BROOKS E. KLEBER*

A THOUSAND JOBS

Called upon to perform a variety of duties, a chemical officer may feel that he has a thousand jobs. He is actually responsible for the various functions of personnel, intelligence, training and operation, and supply as they pertain to chemical units and activities. In addition, he can be plagued by any number of "additional" duties. To fully benefit from the many chemical services, a division must have commanders who are cognizant of the advantages to be derived from the various chemical units and munitions as well as a chemical officer with the ability and initiative to fully publicize and implement the services he has at hand.

An excellent example of the resourcefulness of a division chemical officer was provided in September 1944 when the 5th Infantry Division was crossing the Moselle River at Arnaville, France. The smoke screen which covered this operation was affected adversely by a number of local variations in wind direction. This difficulty was compounded by the lack of adequate observation from the friendly side of the river. Lt. Col. Levin B. Cottingham, Chemical Officer of the 5th Division, in an effort to improve the observation and control of the screen, decided to experiment with aerial observation. Borrowing a liaison plane and pilot from division artillery, the Colonel made at least three observation flights daily.

Observation from the air disclosed defects in the screen which were not visible from the ground. Moreover, changes in the wind direction were noted which enabled the observer to radio orders for generator shifts before any serious gaps in the screen could develop. In subsequent 5th Division river crossings, aircraft were used to observe screens and to reconnoiter areas prior to setting up the generators. With the selection of the best generator sites there was a reduction in the number of generator shifts which had to be made after operations began.

The files of the Historical Office, as far as the activities of division chemical officers are concerned, are not always complete. Therefore, we would appreciate any information on the various duties of division chemical officers and their sections as well as the names of personnel.

*Member of the Staff, Historical Office, office of the Chief Chemical Officer.

SECRETARY WILSON'S ADDRESS

(Continued from page 54)

striving for peace at all times even while we must be preparing for possible war. Realizing that we live in an age of peril, we must now plan for a strong defense over a longer period of time. Obviously no one knows what is going to happen in the next decade. I am still hopeful that we will not have a third world war. The great enigma of the twentieth century is the fact that, after victory in war, no nation seems to know how to win the peace. In our generation we have seen this happen twice. With a great effort from America, two world wars have been won. Without understanding what it takes to win the peace, two prospects for lasting peace have apparently been lost. I am hopeful, however, that, if while preparing for possible war we also strive to figure out what it takes to win peace after a war and start to put some of those policies into effect, we will still avoid a third world war. This is really the great challenge that faces all mankind today.

ASST. SEC'Y THOMAS

(Continued from page 15)

plan as current conditions will permit—but there is always a plan and a good one.

They are doing just that now. They are working on, and will soon have, a well-laid out, long-term basic plan for the miliary services so whatever amount of money the Congress appropriates to the services will be spent on a programmed basis rather than on a feast and famine basis.

Frankly, I know of nothing that should be of greater interest to those of you in commerce and industry. You then yourselves can also make long-range plans and not be subjected to such abrupt starts and stops.

New Departmental Projects

Along these lines I would like to cite to you a few of the things which are now being given top priority by the Department of Defense.

(1) A committee of outstanding fiscal experts has just been formed by Mr. Wilson to establish standard accounting and fiscal systems in the 4 services. This will be a great step forward and will give financial accountability along with management responsibility—something that has been badly needed by the services but which they have not had heretofore.

(2) In my office, we are starting to review the present Armed Services Procurement Regulations with the idea of improving and simplifying these Regulations.

(3) We are working toward completion of a standard catalog for all the services. This will purify approximately 4 million items to probably less than 1 million 500 thousand items. This will not only result in interchangeability but in less inventory and greater turnover—all necessary ingredients, as you well know, for any successful operation.

(4) We are also developing a standard system of inspection—rather than each service having an inspection office in one plant, and numerous inspectors, we are developing a program of assigning the full responsibility of inspection to one service and setting up standard procedures of inspection which will take much less manpower and should be much more efficient. Over 12,000 such assignments have already been made.

In summary, the present Department of Defense is establishing policies, procedures and techniques for coordinating and standardizing, insofar as possible, the operations of all four of the services.

Now, I would like to tell you what I personally think of our military leaders. They are, by and large, outstandingly able men. For the most part, they are men who would have been successful in any business enterprise they might have entered, but they chose the military services and accepted the monetary sacrifices that go with it because of the life and venturesome nature of the services—and frankly the services do have much color and many compensations.

World's Biggest Business

In conclusion, we must remember the four services have only seen their real growth since World War II. Prior to that, they were, as I said before, not of great size as such but today they are by far the biggest business in the history of the world.

The leaders of the military services realize this. They realize they are now conducting large operations and they are going to continue to conduct large operations. They also realize that they can't operate and free-wheel independently and do the job they want to do, and that is expected of them, by the Congress and the people, unless their activities are properly coordinated.

They also recognize that the policy and coordination has to come from some central source and that these policies should logically be established by the Department of Defense—that is what it was created for—they also know they now have to have, and they themselves want, modern supply, fiscal and accounting systems, and this new Administration expects to give them that.

All of this should result in giving you as citizens more defense for your dollar—a sounder long-range defense program, and help maintain a sound economy and monetary structure which we must have if we're not to lose the war before we have even started to fight it.

Frankly, I have found nothing but complete cooperation within the services and the desire of all hands to get the job done. Don't let anyone tell you that there is dissension and confusion in the services and in the Pentagon. On the contrary, I believe you have an excellent team in the Defense Department, the Army, the Navy, the Air Force and the Marine Corps and that they are not only working as a team but they are unified to a much greater extent than any of you realize.

The CHEMICAL CORP BOARD

Left to Right Seated—Samuel P. DiMattia, Lilian S. Campbell, Madge C. Cheek, Gloria A. Sacks, Frances C. Revis, Helen L. Cooley. First Row Standing—T. D. Cunningham, PFC Charles E. Hoke, PFC Paul F. Lindeman, PFC Howard W. Westerman, PFC George E. Commerford, Pvt Alan Gelberg. Second Row Standing—Joseph F. Schaeffer, John L. Traina, Rudolph Levy, Dr. Harold S. King, Col. Nelson McKaig, Jr., Major Jose A. Andino. Third Row Standing—O. B. Mahaffie, John Robertson, David M. Cawthorne, Col. R. C. Benner, President; Lt. Arvie L. Wrang, Col. Lee O. Rostenberg, Col. Theodore P. Gahan. Back Row Standing—E. L. Sawyer, Dr. J. Howard Brown, Col. Robert C. Mottley, Col. Leonard M. Johnson, Deputy President; Lt. Col. C. P. Holm, Col. Alexander Grendon, Col. S. P. Coblentz. (Since this picture was taken Col. Johnson has succeeded Col. Benner, now retired.)

By

By MRS. ANNE W. SHIPLEY*

The conception of branch or technical service branch boards dates back more than thirty years. The Chemical Corps Board, however, was not established until 1926. It is a Department of the Army Agency, authorized by an Army Regulation, is designed to be the principal military advisory agency to the Chief Chemical Officer, and reports directly to the Chief Chemical Officer. Broadly speaking, its purpose is to determine whether an idea in someone's mind has, during the long process of development, been successfully converted into an item which, when placed in the soldier's hands, will assist him, or his organization, to win battles. This purpose is accomplished by means of unbiased evaluation of proposed final or end items developed by the Chemical Corps. The controlling consideration in all these evaluations is—will the item work under field conditions, and in any likely Theater of Operations? The Board endeavors to look at all things from the standpoint of the user, with no prejudice either for or against the item concerned. Sometimes the idea does not result in an item but may become a principle or concept. The Board then must determine whether this new principle or concept, if adopted, will improve the capabilities of the Armed Forces.

The work of the Board is varied in nature, being investigative, fact-finding and advisory. Furthermore, the Board sometimes acts as a referee and endeavors to reconcile opposing approaches to a problem; sometimes, it acts as a prod; and sometimes it endeavors to act as a brake in order to prevent ill-conceived and precipitate action. Some of the areas in which the Board has responsibilities are: Military Doctrine; Research and Development; Plans and Training; Materiel and Procurement.

The mission of the Board is accomplished in various ways; by research culminating in staff studies on all phases of CBR warfare, by projects in the nature of user and service tests of CBR materiel and equipment, and by critical review of training manuals, field manuals and other publications. In addition, advising opinions on any subject whatsoever, which may be of interest to the Chemical Corps, are furnished to the Chief Chemical Officer and any agency within the Corps. The Board is well fitted to do this since it has no axe to grind, and can be relied upon to give an unbiased considered opinion. The value to the Corps of an organization performing such a function, is quite obvious. At the present time, there are 40 active projects, and 15 staff studies being prepared. Test work for the Board is conducted at the various Chemical Corps Proving Grounds and at army posts throughout the country. There is also a test team from the Board operating in Korea. It might be well to point out the relationship between Field Forces Boards (combat arms) and the Chemical Corps Board, which is a Technical Service Board. The conduct of final tests for Army Materiel, in general, is properly a Field Forces Board function and responsibility. But, as most Field Forces Boards and Air Force test agencies are neither technically qualified nor properly equipped to conduct tests involving certain highly technical Chemical Corps items, they frequently call upon the Chemical Corps Board which is qualified to conduct such tests. Under these circumstances, the Chemical Corps Board acts as the agent of the Field Forces Board. Representatives of both Boards are usually present at joint tests.

*Mrs. Shipley is the Recorder, Chemical Corps Board, Army Chemical Center, Md.

The same friendly and mutually beneficial relations exist with Navy and Air Force Boards.

The recently activated Chemical Weapons Battalion has been placed under the supervision of the Chemical Corps Board. The Battalion is located at Dugway Proving Ground, Tooele, Utah. It will furnish a supply of test facilities and personnel for use in conducting Board field tests. It is probable that representatives, both military and civilian, from the Board, will be stationed there in order to provide necessary liaison and co-ordination.

In order to accomplish its misson efficiently, the Board is divided into eight Divisions, i.e., Testing, Protection, Weapons, Munitions, Agents, Environmental, Organization and Training, and Air. Each Division is headed by a Chemical Corps Officer and, in order to provide the necessary continuity of policy, Divisions have technically trained civilians of high professional attainment who, in addition to their civilian training and experience, have had military experience in World Wars I and II and in the Korean War. The Board encourages the civilian members to take an active part in Reserve training. Military personnel assigned to the Board are normally of high rank, and broad, varied experience. Thus to technical proficiency of the civilian is added the soldiers' military knowledge, experience, and familiarity with the limitations that war imposes on the free play of technical development. This makes a well balanced team. This gives the Board a wide outlook and a practical approach to the problems presented. It is a small organization, consisting, at the present time, of 28 people: 10 officers; 11 professional civilians and an Administrative Staff of 7, including a messenger-driver. War-time expansion, if any, would probably be near test facilities at Dugway Proving Ground. The Commanding General, of each of the three Chemical Corps Commands, designates a senior officer of his Command as Liaison Officer to the Board, who is a non-voting associate of the permanent Board members. In addition, Liaison Officers of the using services and Allied Nations to the Chemical Corps are ex-officio non-voting associates of the Board. It is the responsibility of the Liaison Officer to keep his Chief informed concerning the activities of the Board, and also to explain to the Board the viewpoint of his Division with reference to Board work.

THE INCENDIARY BOMB

(Continued from page 36)

was the inferno that even glass, concrete, and steel bars were melted, and wooden buildings ignited before the fire front had reached them.

The revolutionary tactics of General LeMay were successful beyond all expectations. Losses in aircraft were comparatively low, for of the 302 planes over the target only 14 failed to return.

Following the Tokyo raid, Nagoya, Osaha, Kobe, and again Nagoya received the terrible punishment of incendiary bombing at about two-day intervals. During the rest of the war, sixty-nine Japanese cities felt the effects of the fire blitz. Unable to stand the ordeal by fire, "Japan's ability to continue the war finally collapsed amid the ashes of her burned-out cities."

Work of Chemical Units

Any study of the incendiary bomb would be incomplete without some mention of the air chemical companies which stood behind air chemical operations. The chemical companies, air operations, the chemical depot companies, aviation, and the chemical maintenance companies, aviation, were charged with the storage and maintenance of air chemical munitions and the handling and loading of chemical munitions at air bases. Their personnel indeed were among the unsung heroes of World War II. These units exist no more, and their duties in Korea were carried out by Air Force personnel.

Korea has brought about still other changes. In Korea the tactical fire bomb was used extensively but there were few suitable targets for the incendiary bomb.

COLONEL LESLIE T. SUTHERLAND

Col. Leslie T. Sutherland, who served in the Army Chemical Corps in both World Wars I and II and who was a Director-at-Large of the A.F.C.A., during the period 1947-49, died at his residence in Medford, Oregon on May 29th, 1953.

Col. Sutherland, after a long career in the field of chemical research and development, retired on Nov. 1, 1952 and moved to Medford, Oregon. However, until his death, he still maintained his connections as consultant for Barrett Division, Allied Chemical and Dye Corporation with which organization he had been employed continuously since 1929, except during his periods of war service.

Col. Sutherland was born Oct. 11, 1887 in Yonkers, New York and was graduated from Cornell University with a degree in chemistry in 1909.

During his active period with Barrett, he represented his concern on technical and industrial committees of the American Society for Testing Materials concerned with synthetic resins and plastics. He was the author of a number of technical articles and patents in his field of work. He was a member of the Manufacturing Chemists Association; American Chemical Society; the Society of the Plastics Industry; American Institute of Chemists; American Legion; the Armed Forces Chemical Association; the Cornell Club and the Army-Navy Club of Washington, D. C. He was also a Mason.

In World War II, Col. Sutherland served in the Chemical Corps during the period April, 1942 to November, 1947 and was awarded the Legion of Merit.

COMBAT SMOKE IN KOREA

(Continued from page 40)

and in the places and at the times desired by the combat units. Commanders and staff officers alike, who have benefited by smoke coverage, are convinced that smoke concealment has resulted in substantial saving of lives and materiel, and has in many cases greatly expedited or even made possible the supply of exposed MLR and outpost positions. It has come to be accepted that where there is smoke, there will *not* be fire. The Communists do not like to waste ammunition where they cannot observe results.

Communists Use Smoke Too

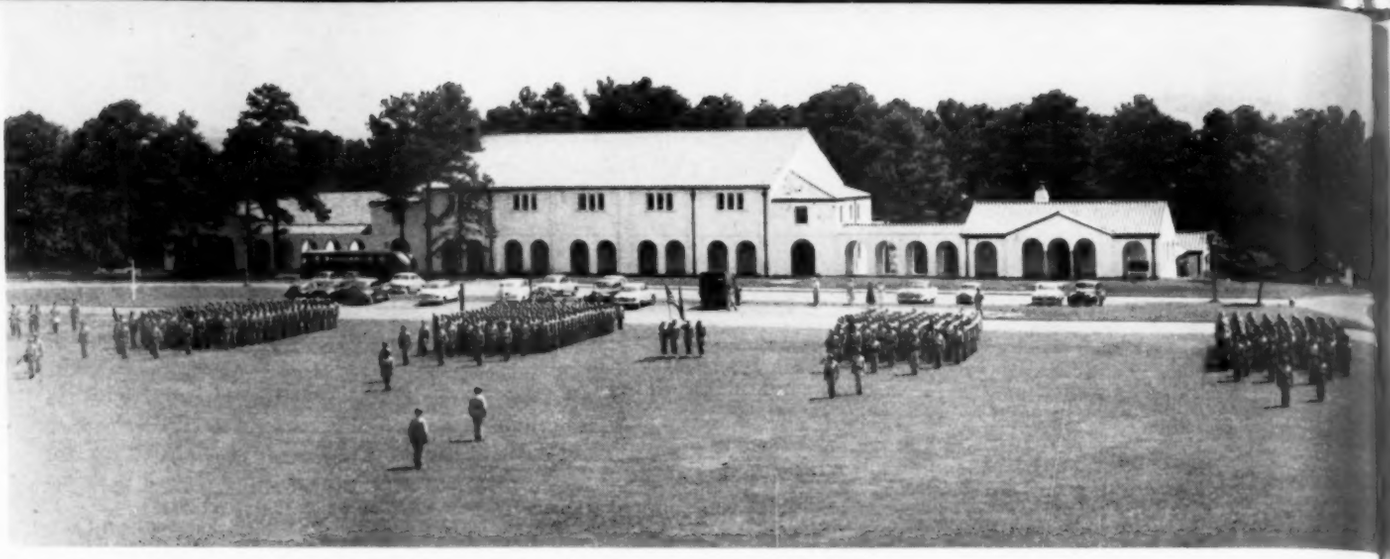
Neither have the Communists failed to perceive the advantages of smoke for their own efforts; during the late spring of 1953 there was increasing evidence that the CCF capability to use smoke as a tactical role has improved. Smoke has been used by them in important operations to cover an advance in preparation for an attack, to cover withdrawals, and to deny friendly observation of regrouping and reinforcement activities for a counterattack. They even withdraw into their own smoke artillery and mortar fire without lifting the fire.

In earlier days of the Korean war, extensive training demonstrations in smoke tactics, using both pots and generators, were given to educate and train infantry and artillery commanders and personnel in the use of smoke. U. S. Army and Marines, Commonwealth and other United Nations troops, and the ROK Army were included in these demonstrations, which were well-received. But the use of smoke still comes down mainly to a job of selling by division chemical officers, who must show commanders where smoke can help. Actual operations have been the best demonstrations, and during the past year particularly, many men have witnessed the versatile missions accomplished by smoke in Korea, and the adaptability with which smoke weapons and munitions have been used to assist their operations by saving lives and materiel. Commanders of units newly moved into the line, who inherited a smoke mission in their area, were often skeptical and sometimes stubborn about smoke, and called off the smoke, resulting in dramatic but tragic results in immediate casualties. But once having seen the value it is almost impossible to withdraw smoke support for more important missions, except by direct command from higher echelons.

Korean Experience Lessons

Among the lessons learned in Korea on the use of smoke in tactical situations is that more training for combat officers is required in the proper use of all types of smoke weapons and units. Smoke tactics should be taught at the level at which infantry and artillery techniques are taught—at the basic and advanced courses at the Service Schools, where it should be integrated into tactical problems and situations. Further indoctrination should be included in the more advanced schools.

For the Chemical Corps, itself, several important facts have again been brought to light. The variety of tactical situations in which smoke can be useful is the most obvious of these; the flexibility required in the operation of a smoke generator company in direct support of combat is another. The need for bolstering maintenance training at all echelons is equally apparent. And most important of all is that Chemical Corps officers must be well-trained to recognize the possibilities and to be prepared to assist commanders in the most effective use of this versatile tool of combat.



Chemical Corps troops at Ft. McClellan formed for parade and review for the decoration and retirement ceremony there on August 1.

DECORATION CEREMONIES AT FT. McCLELLAN

A parade and review by troops of the Chemical Corps Training Command, Ft. McClellan, Alabama was held there on August 1 in honor of three officers receiving decorations, and a Master Sergeant retiring after completing thirty years service.

Maj. General E. F. Bullene, Chief Chemical Officer, Department of the Army, reviewed the troops and presented the decorations.

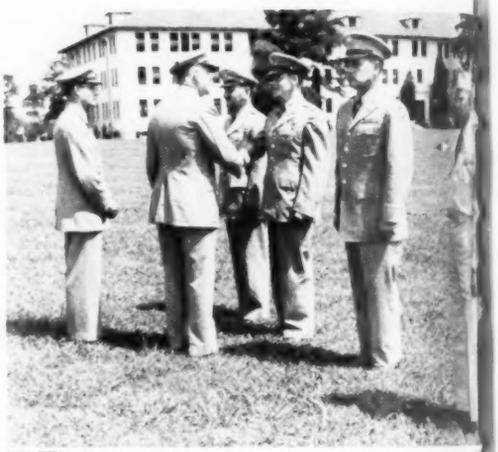
Colonel Edwin Van Keuren, Commandant of the Chemical Corps School, received the Bronze Star Medal for meritorious service on a previous assignment as Commandant of the Far East Command Chemical School in Japan. Colonel Van Keuren is President of the Ft. McClellan Chapter of the A.F.C.A.

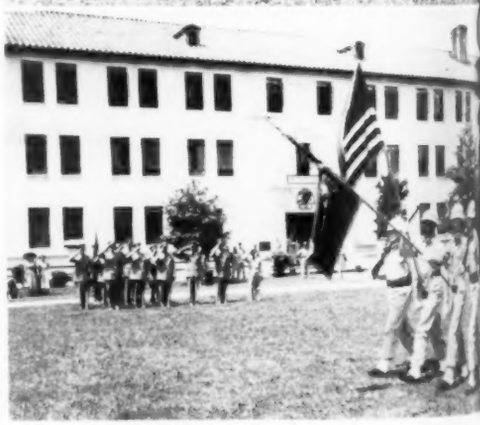
Lt. Miles F. Deeg also was the recipient of the Bronze Star Medal awarded for outstanding performance of duty as Chief of the Maintenance Division of the Chemical Depot in Japan.

Maj. Marshall L. Mott III was awarded the Army Commendation Ribbon for meritorious service as an instructor in the Far East Command Chemical Group.

The parade and review was also in honor of M/Sgt. Zacarias Tolarba, who had just completed thirty years of service in the Philippine Scouts and the U.S. Army. A native of Janivay, Iloilo, P.I., Sergeant Tolarba enlisted in the Scouts, an auxilliary of the U.S. Army in the Philippines, on May 7, 1923. He participated in the defense of the islands during the Japanese invasion after Pearl Harbor and was taken prisoner when Bataan fell on April 9, 1942. Sergeant Tolarba remained in the Scouts until 1949 when he became an American citizen, enlisted in the Regular Army and was assigned to duty at Ft. McClellan.

The troops participating in the ceremony included units of the Chemical Replacement Training Center, Hqrs. Det., Trng., Cmd., School Student Detachment, Composite Troop Unit, 476th Cml. Bn., and 218th Smoke Generator Bn.

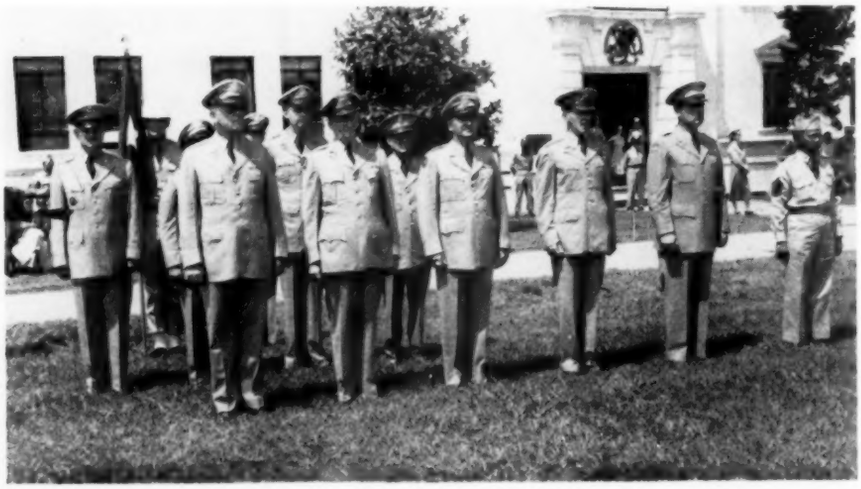




TOP: General Bullene congratulating Lieut. Deeg on his being awarded the Bronze Star Medal. Col. Van Keuren who also received this decoration is at Lt. Deeg's right and to his left are Major Mott and M/Sgt. Tolarba.

ABOVE: Color guard passing the reviewing party in position in front of the Chemical Corps School Building at Ft. McClellan.

U. S. ARMY PHOTOS



The reviewing party, Front Row, left to right: General Bullene; Col. John R. Burns, Commanding Officer Chemical Corps Training Command; Col. Van Keuren; Lieut. Deeg; Major Mott and M/Sgt. Tolarba; Second Row: Col. Richard R. Danek, Deputy Commander, Training Command; Col. Donald E. Yanka, (behind Gen. Bullene) Lieut. B. C. Moore and Lt. Col. Alfred G. Cournoyer all of the Training Command Staff.

Rubber Engineered by GENERAL

SILENTBLOC Vibration Mountings give engineered accuracy in control of vibration and shock load in motors and equipment.

MOULDED RUBBER parts of any size, shape and type of rubber, to meet your specifications for accuracy and performance.

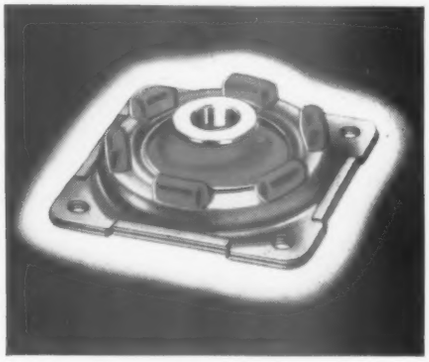
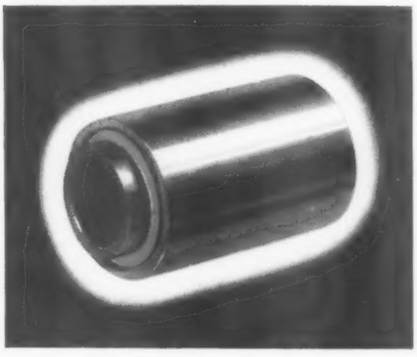
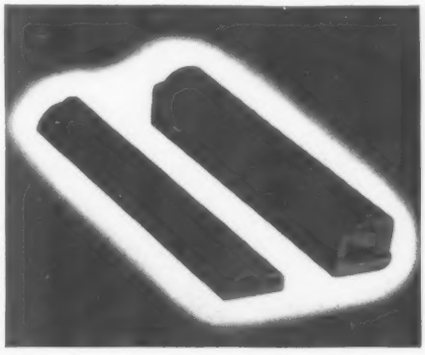


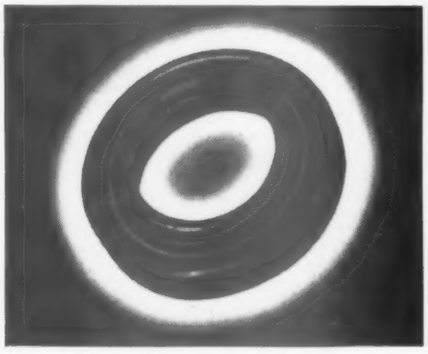
PLATE MOUNTS of any metal and rubber, for vibration isolation in aircraft, radio, electrical equipment, instruments.



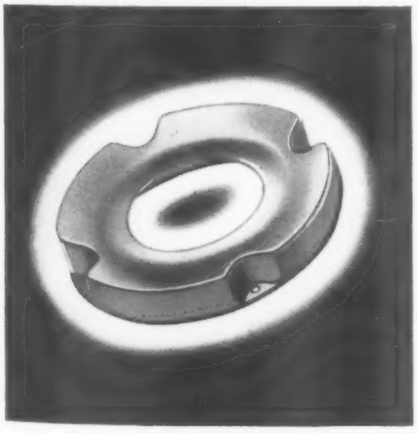
SILENTBLOC BEARINGS for oscillating equipment—need no lubrication, work silently, long lasting, unharmed by dust or liquid.



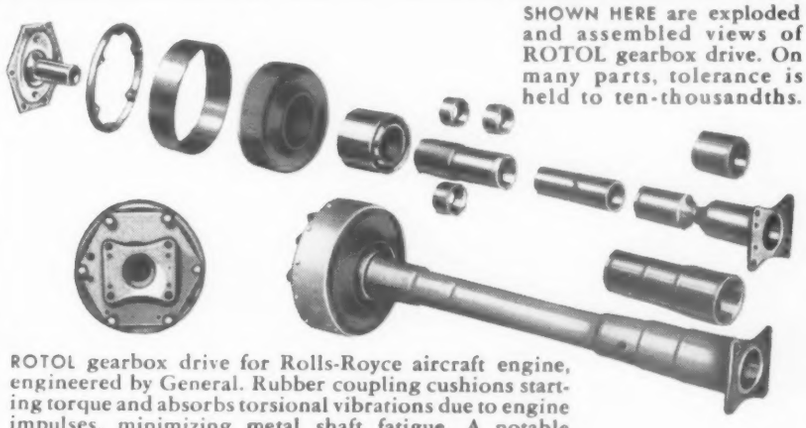
EXTRUDED RUBBER in any solid or hollow shape, made accurately to your specifications from any type of rubber.



OIL SEALS for lubricant and hydraulic applications, engineered to meet your needs in efficiency and long service.



RUBBER-bonded-to-metal parts of all kinds, made to specification. In ROTOL drive, shown at right, rubber is bonded to metal.



SHOWN HERE are exploded and assembled views of ROTOL gearbox drive. On many parts, tolerance is held to ten-thousandths.

ROTOL gearbox drive for Rolls-Royce aircraft engine, engineered by General. Rubber coupling cushions starting torque and absorbs torsional vibrations due to engine impulses, minimizing metal shaft fatigue. A notable example of General's skill in precision engineering.

MECHANICAL GOODS DIVISION • WABASH, INDIANA

The GENERAL TIRE & RUBBER CO.

Makers of America's Top Quality Tires

THE GENERAL TIRE

new

JUST PUBLISHED

Contains the latest information on Caustic Soda in 64 factual pages of illustrations, charts, tables, diagrams. Includes comprehensive data on methods of analysis, shipping, handling, storage and unloading.

This authoritative handbook, by the Technical Staff of the Columbia-Southern Chemical Corporation, is available without charge to users of Caustic Soda and to others whose work involves the use of this product.

Write on company stationery to Columbia-Southern Chemical Corp., 632 Fort Duquesne Boulevard, Pittsburgh 22, Pennsylvania.

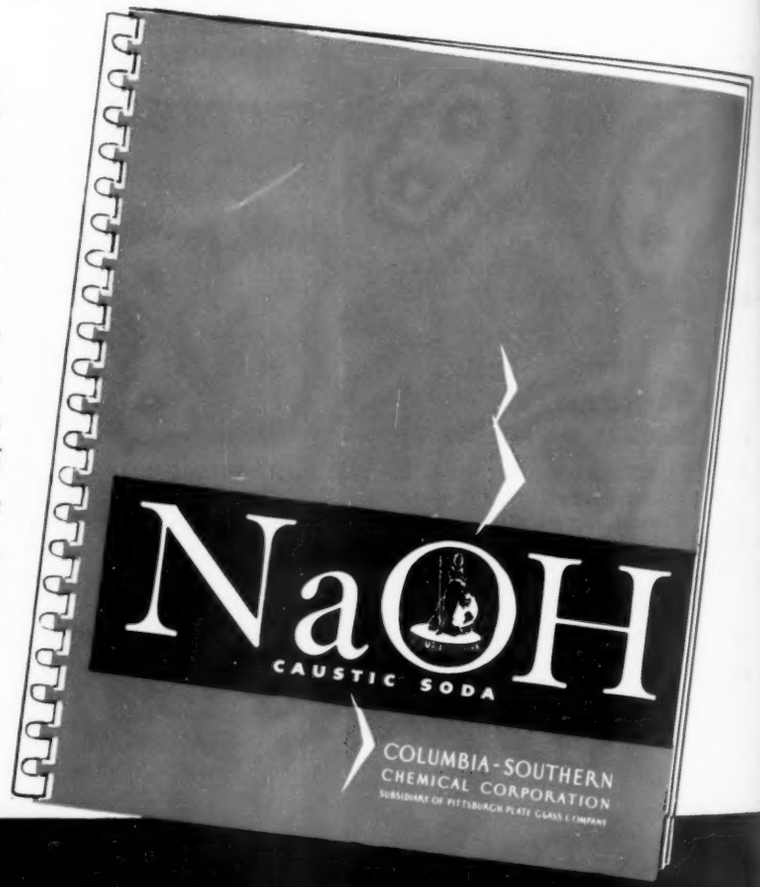


TABLE OF CONTENTS:

COLUMBIA-SOUTHERN CHEMICAL CORPORATION

SUBSIDIARY OF PITTSBURGH PLATE GLASS COMPANY

420 FORT DUQUESNE BOULEVARD, PITTSBURGH 22, PA.

DISTRICT OFFICES: BOSTON • CHARLOTTE
CHICAGO • CINCINNATI • CLEVELAND
DALLAS • HOUSTON • MINNEAPOLIS
NEW ORLEANS • NEW YORK • PHILADELPHIA
PITTSBURGH • ST. LOUIS • SAN FRANCISCO